COLORADO WATER CONSERVATION BOARD

WATER SUPPLY RESERVE ACCOUNT APPLICATION FORM

Mount Pisgah Dam/Wrights Reservoir Outlet Works Rehabilitation

Name of Water Activity/Project

Pisgah Reservoir and Ditch Company

Name of Applicant

Arkansas Basin RT

Approving Basin Roundtable(s)
(If multiple basins specify amounts in parentheses.)

Amount from Statewide Account:	$136,345
Amount from Basin Account(s):	$ 25,000
Total WSRA Funds Requested:	$161,345

Application Content

Required Exhibits

A. Statement of Work, Budget, and Schedule
B. Project Map
C. As Needed (i.e. letters of support, photos, maps, etc.)

Appendices – Reference Material

1. Program Information
2. Insurance Requirements
3. WSRA Standard Contract Information (Required for Projects Over $100,000)
4. W-9 Form (Required for All Projects Prior to Contracting)

Water Supply Reserve Account – Application Form
Revised December 2011

Part I. - Description of the Applicant (Project Sponsor or Owner);

1.	Applicant Name(s):	Pisgah Reservoir and Ditch Company		
	Mailing address:	P.O. Box 352 Rocky Ford, CO 81067		
	Taxpayer ID#:	84-0407037		
	Primary Contact:	Wayne Whittaker	Position/Title:	Secretary
	Email:	Waynewhittaker32@yahoo.com		
	Phone Numbers:	Cell:	Office:	719-254-3389
	Alternate Contact:	Alan Frantz	Position/Title:	Director
	Email:	frantzfarms@rural-com.com		
	Phone Numbers:	Cell: 719-469-0397	Office:	

2. Eligible entities for WSRA funds include the following. What type of entity is the Applicant?

	Public (Government) – municipalities, enterprises, counties, and State of Colorado agencies. Federal agencies are encouraged to work with local entities and the local entity should be the grant recipient. Federal agencies are eligible, but only if they can make a compelling case for why a local partner cannot be the grant recipient.
	Public (Districts) – authorities, Title 32/special districts, (conservancy, conservation, and irrigation districts), and water activity enterprises.
X	Private Incorporated – mutual ditch companies, homeowners associations, corporations.
	Private individuals, partnerships, and sole proprietors are eligible for funding from the Basin Accounts but not for funding from the Statewide Account.
	Non-governmental organizations – broadly defined as any organization that is not part of the government.

3. Provide a brief description of your organization

The Pisgah Reservoir and Ditch Company is a mutual ditch company and as such a non-profit corporation. It was incorporated in 1923.
The Company has 283 shareholders who are also associated with the Canon Heights Irrigation and Reservoir Company and 290 shareholders who are associated with the Catlin Canal Company. Water is delivered down Four Mile Creek to the Pisgah shareholders at Canon City. Water is delivered down Four Mile Creek and the Arkansas River to Pisgah shareholders at Otero County, Colorado. Park Center Water Company has shares in Canon Heights Irrigation and Reservoir Company and uses some of the water for domestic use. Current water usage is about 1000 A.F. per year, depending on the snow pack and rainfall. Operations are funded by annual assessment on the shareholders and leasing of reservoir recreation rights.

4. If the Contracting Entity is different then the Applicant (Project Sponsor or Owner) please describe the Contracting Entity here.

n/a

5. Successful applicants will have to execute a contract with the CWCB prior to beginning work on the portion of the project funded by the WSRA grant. In order to expedite the contracting process the CWCB has established a standard contract with provisions the applicant must adhere to. A link to this standard contract is included in Appendix 3. Please review this contract and check the appropriate box.

[X] The Applicant will be able to contract with the CWCB using the Standard Contract

[ ] The Applicant has reviewed the standard contract and has some questions/issues/concerns. Please be aware that any deviation from the standard contract could result in a significant delay between grant approval and the funds being available.

6. The Tax Payer Bill of Rights (TABOR) may limit the amount of grant money an entity can receive. Please describe any relevant TABOR issues that may affect the applicant.

n/a

Water Supply Reserve Account – Application Form
Revised December 2011

Part II. - Description of the Water Activity/Project

1. What is the primary purpose of this grant application? (Please check only one)

	Nonconsumptive (Environmental or Recreational)
	Agricultural
	Municipal/Industrial
	Needs Assessment
	Education
X	Other Explain: Structural, affecting recreation, agriculture, residential and municipal uses.

2. If you feel this project addresses multiple purposes please explain.

Wright Reservoir provides water to the Canon Heights Irrigation and Reservoir Company and the Catlin Canal Company for Agricultural, Domestic, and Municipal (City of Rocky Ford) use. The DOW owns over 2,000 shares of Catlin Canal water (approximately 11%).

Funding for the maintenance of Wright Reservoir has been partially provided by leasing recreational rights to the reservoir. Most recently, the reservoir was leased to a private club, but the Pisgah Reservoir and Ditch Company is currently working with the DOW regarding an agreement to manage the area. This would open the Reservoir to the public, for non-consumptive recreational uses including fishing, bird-watching and hiking.

3. Is this project primarily a study or implementation of a water activity/project? (Please check only one)

	Study	**x**	Implementation

4. To catalog measurable results achieved with WSRA funds can you provide any of the following numbers?

	New Storage Created (acre-feet)
	New Annual Water Supplies Developed, Consumptive or Nonconsumptive (acre-feet)
2,192 af	Existing Storage Preserved or Enhanced (acre-feet)
	Length of Stream Restored or Protected (linear feet)
120 ft	Length of Pipe/Canal Built or Improved (linear feet)
$25,000	Efficiency Savings (acre-feet/year OR dollars/year – **circle one**)
116 ac	Area of Restored or Preserved Habitat (acres)
	Other -- Explain:

4. To help us map WSRA projects please include a map (Exhibit B) and provide the general coordinates below:

Latitude:	38-47'-37.47"	Longitude:	105-16'-14.45"

5. Please provide an overview/summary of the proposed water activity. Include a description of the overall water activity and specifically what the WSRA funding will be used for. A full **Statement of Work** with a detailed budget and schedule is required as **Exhibit A** of this application.

Brief Overview of Water Activity

Mount Pisgah Dam is a large size, significant hazard earth embankment located in Teller County, about 12 miles from Cripple Creek, Colorado. The dam is located on Fourmile Creek and impounds Wrights Reservoir, with a capacity of approximately 2,192 acre-feet supplied by direct inflow from Fourmile Creek. The embankment has an upstream slope at approximately 3H:1V, a crest width of about 10 feet, and a downstream slope of approximately 2H:1V.

The dam was originally constructed around 1911. There was an upstream slope failure around 1928. After the slope failure, the upstream ends of the original outlet works were plugged, a new outlet conduit was constructed through the right abutment, and the upstream slope was rebuilt. The spillway is located at the left abutment and was enlarged in 1988.

An SEO Inspection was made in June, 2011 (see attached report). The existing storage capacity of the reservoir is in jeopardy of being restricted by the State Engineer for safety deficiencies. The existing gate operators have become nearly inoperable. The Company hired RJH Consultants, Inc. to conduct further analysis of the dam. Their analysis was followed by an evaluation of alternatives to rehabilitate the Mount Pisgah Dam/Wrights Reservoir Outlet Works.

The alternative chosen provides the greatest flow capacity, and consists of removing the existing downstream control valves and installing a new upstream control valve on the existing outlet works intake structure located near the upstream toe of the dam. The existing valve house will be removed and replaced with a new structure that will be located at the same location. The existing concrete intake structure will be modified as necessary to accommodate the improvements.

This water activity will ensure that existing storage capacity will be maintained. Because the Company is negotiating with DOW to open the area for public access, the project has non-consumptive recreational value as well.

Preliminary design drawings are attached. The objective of this funding will be to complete design elements and construction of the repairs.

Engineering costs for this project to date, paid by the Pisgah Ditch and Reservoir Company, total $33,923.35. The estimated cost to complete this project is $362,690. In addition to monies spent, Pisgah Ditch and Reservoir Company has committed an additional $40,000 in matching funds for this project. The Company is asking for $25,000 in Basin funds, $136,345 in Statewide funds, and they will be applying for a CWCB loan in the amount of $161,345.

Part III. – Threshold and Evaluation Criteria

1. This water activity meets the eligibility requirements outlined in Part 2 of the Criteria and Guidelines. This is a structural water project, and the applicant, Pisgah Reservoir and Ditch Company, is an eligible entity.

1. a) The water activity is consistent with Section 37-75-102 Colorado Revised Statutes.[1] The project will not supersede, abrogate, or otherwise impair the State's current system of allocating water within Colorado nor does it in any manner repeal or amend the existing water rights adjudication system. The project does not affect the State Constitution's recognition of water rights as a private usufructuary property right nor is it intended to restrict the ability of the holder of a water right to use or to dispose of that water right in any manner permitted under Colorado law.

1. b) The water activity has been approved by the Arkansas Basin Roundtable (BRT). It was approved unanimously by the Needs Assessment Committee, and passed by consensus at the March 2012 Roundtable meeting. Several roundtable members expressed their support of the application, and there were no dissenting opinions.

1. c) The water activity meets the provisions of Section 37-75-104(2), Colorado Revised Statutes.[2] The project will preserve 2,192 acre feet of existing storage that is in danger of being lost. It will also restore 116 acres of aquatic habitat. It benefits recreational users in Teller County, as well as agricultural, residential and municipal water users in the lower Arkansas Valley.

[1] 37-75-102. Water rights - protections. (1) It is the policy of the General Assembly that the current system of allocating water within Colorado shall not be superseded, abrogated, or otherwise impaired by this article. Nothing in this article shall be interpreted to repeal or in any manner amend the existing water rights adjudication system. The General Assembly affirms the state constitution's recognition of water rights as a private usufructuary property right, and this article is not intended to restrict the ability of the holder of a water right to use or to dispose of that water right in any manner permitted under Colorado law. (2) The General Assembly affirms the protections for contractual and property rights recognized by the contract and takings protections under the state constitution and related statutes. This article shall not be implemented in any way that would diminish, impair, or cause injury to any property or contractual right created by intergovernmental agreements, contracts, stipulations among parties to water cases, terms and conditions in water decrees, or any other similar document related to the allocation or use of water. This article shall not be construed to supersede, abrogate, or cause injury to vested water rights or decreed conditional water rights. The General Assembly affirms that this article does not impair, limit, or otherwise affect the rights of persons or entities to enter into agreements, contracts, or memoranda of understanding with other persons or entities relating to the appropriation, movement, or use of water under other provisions of law.

[2] 37-75-104 (2)(c). Using data and information from the Statewide Water Supply Initiative and other appropriate sources and in cooperation with the on-going Statewide Water Supply Initiative, develop a basin-wide consumptive and nonconsumptive water supply needs assessment, conduct an analysis of available unappropriated waters within the basin, and propose projects or methods, both structural and nonstructural, for meeting those needs and utilizing those unappropriated waters where appropriate. Basin Roundtables shall actively seek the input and advice of affected local governments, water providers, and other interested stakeholders and persons in establishing its needs assessment, and shall propose projects or methods for meeting those needs. Recommendations from this assessment shall be forwarded to the Interbasin Compact Committee and other basin roundtables for analysis and consideration after the General Assembly has approved the Interbasin Compact Charter.

1.d) Matching Requirement: For requests from the **Statewide Fund**, the applicants is required to demonstrate a **20 percent** (or greater) match of the request from the Statewide Account. Statewide requests must also include a minimum match of **5 percent** of the total grant amount from Basin Funds. Sources of matching funds include but are not limited to Basin Funds, in-kind services, funding from other sources, and/or direct cash match. Past expenditures directly related to the project may be considered as matching funds if the expenditures occurred within 9 months of the date the application was submitted to the CWCB. Please describe the source(s) of matching funds. (NOTE: These matching funds should also be reflected in your Detailed Budget in **Exhibit A** of this application)

The project funding is summarized here:

WSRA Loan:	$161,345
Basin Funds:	$ 25,000 (over 5% match)
Statewide Funds:	$136,345
Cash Match:	$ 40,000 (over 20% match)
Total	$362,690

Plus:
Pisgah Reservoir & Ditch Company $ 33,923.35 spent between August 2011 and February 2012 for preliminary engineering and design.

2. For Applications that include a request for funds from the **Statewide Account**, describe how the water activity/project meets all applicable **Evaluation Criteria.**

Tier 1: Promoting Collaboration/Cooperation and Meeting Water Management Goals and Identified Water Needs

a. The water activity addresses multiple needs or issues, including consumptive and/or non-consumptive needs. This structural project preserves existing storage capacity that is currently in jeopardy of being restricted by the State Engineer for safety deficiencies. It benefits the environment by ensuring the preservation of 116 acres of surface water habitat. The Pisgah Reservoir and Ditch Company is currently negotiating with DOW in hopes of opening the reservoir to public access. This project allows the reservoir to remain a fishery, and preserves bird and wildlife habitat.

b. The project will benefit numerous water interests, as shareholders/water users represented in the Pisgah Reservoir and Ditch Company include the Catlin Canal, Canon Heights Irrigation and Reservoir Company, Park Center Water Company, City of Rocky Ford, and DOW.

c. Although the activity does not create new water or storage, it preserves existing storage capacity that is in danger of being restricted.

Tier 2: Facilitating Water Activity Implementation

d. Funding from the WSRA is critical for this project to be completed. This project would not be implementable by the Pisgah Reservoir and Ditch Company alone. The combination of WSRA Grant/CWCB Loan funding reduces debt service to a manageable level.

e. The amount of matching funds provided by the applicant via direct contributions totals $40,000, an amount much higher than the required 20% match of Statewide Funds. In addition, the applicant has spent $33,923.35 on the project to date, showing their strong commitment to the project.

Tier 3: The Water Activity Addresses Other Issues of Statewide Value and Maximizes Benefits

f. The water activity helps sustain agriculture and meets environmental and recreational needs.

Part IV. – Required Supporting Material

1. **Water Rights, Availability, and Sustainability** – This information is needed to assess the viability of the water project or activity. Please provide a description of the water supply source to be utilized, or the water body to be affected by, the water activity. This should include a description of applicable water rights, and water rights issues, and the name/location of water bodies affected by the water activity.

   The Pisgah Reservoir and Ditch Company received a Decree to the Reservoir on October 3, 1927. The original decree, for irrigation purposes, was transferred from a previous owner, and is dated October 15, 1907. The reservoir, now named Wrights Reservoir, is the water body that will be affected by the water activity. It's located in Water District 12, and is situated on Fourmile Creek, a tributary of the Arkansas River. Proposed repairs will assure the availability and sustainability of the water supply.

2. Please provide a brief narrative of any related studies or permitting issues.

   RJH Consultants prepared a report after their inspection of the dam. That report is included as an attachment, along with the Alternatives Evaluation and their Proposal for Engineering Services.

Statement of Work

WATER ACTIVITY NAME – Mount Pisgah Dam/Wrights Reservoir Outlet Works Rehabilitation

GRANT RECIPIENT – Pisgah Reservoir and Ditch Company

FUNDING SOURCE – Basin/Statewide Funds, CWCB Loan

INTRODUCTION AND BACKGROUND
The Mount Pisgah Dam was built in 1911. It is a large size, significant hazard earth embankment located in Teller County, about 12 miles from Cripple Creek, Colorado. The dam is located on Fourmile Creek and impounds Wrights Reservoir, with a capacity of approximately 2,192 acre-fee supplied by direct inflow from Fourmile Creek.

In July of 2011, the Pisgah Reservoir and Ditch Company received an Inspection Report from the State Engineer's Office (SEO) which detailed multiple issues that need to be addressed, including further inspections to be made after the reservoir was emptied, modifications to the outlet works, new gates/valves, and modifications to the intake structure. Prior to this report, the outlet works had never been inspected.

The Ditch Company secured the services of RJH Consultants, Inc., who performed a detailed inspection of the dam, including an internal inspection of the outlet and intake conduits, as requested by the SEO. RJH then drew up an Evaluation of Alternatives to address SEO concerns.

The Ditch Company chose an alternative based on a flow control concept that would put control upstream only at the intake structure. It provides the greatest Peak Flow capacity. This alternative has the following main components:

- Provide a slide gate on the existing intake structure.
- Extend hydraulic control lines and an air vent from the intake structure to a gate operator in the existing valve house.
- Remove existing valve internal components

GOALS AND OBJECTIVES
The overall objective of this project is to address SEO concerns and make repairs as necessary to ensure the safety of the dam and outlet works. The project will allow for full use of the reservoir's storage capacity, and preserve its recreational uses and environmental values.

- The dam is currently classified as a large size, significant hazard dam and will remain this classification.
- Outlet drawdown capacity will meet current operational criteria and SEO minimum drawdown criteria for a high hazard dam.
- A single upstream hydraulically operated gate will be used for both flow control and SEO drawdown requirements.
- Electrical power, 220 volt-single phase, is currently available to the existing valve house and will remain available for operation of the hydraulic system for the new control gate.

- The existing valve house will be removed and replaced with a new structure that will be in the same location.
- The existing concrete foundation and walkway will be used for the new valve house structure.
- The existing concrete intake structure will not be removed and replaced but will be modified to the extent necessary to accommodate the proposed improvements.

TASKS

TASK 1 – DESIGN

Description of Task
Perform design analyses and prepare drawings for the project.

Method/Procedure
1a. Hydraulic Gate Design and Detail

1b. Trash Rack Design and Detail

1c. Valve House Pre-fab metal building design and detail

1d. Electrical Design and Detail

1e. Design Drawings

1f. Construction Docs and Specs

1g. Design Summary Report

1h. Engineer's Opinion of Probable Cost

1i. Progress Reports, Invoices, 50% Completion Meeting

Deliverable
Completed Drawings, Specs, Opinion of Probable Construction Costs and Design Summary Report

TASK 2 – BIDDING AND PROCUREMENT

Description of Task
Address any comments from the SEO, finalize bid documents, and assist in obtaining and evaluating the bids.

Method/Procedure
2a. Participate in a meeting with the SEO to discuss their review comments.

2b. Provide responses to comments from the SEO on the submitted drawings, specs and Design Report.

2c. Finalize drawings and specs for bidding and prepare Issued for Bid documents.

2d. Pre-bid meeting and site visit.

2e. Evaluate bids.

Deliverable
Stamped drawings and specifications that incorporate the SEO's comments, suitable for bidding and constructing the work

TASK 3 – CONSTRUCTION

Description of Task
Actual construction of the project.

Method/Procedure
3a. Barge and Lift Mobilization/Demobilization

3b. Barge and Lift Operations

3c. Demolition of Internal Valve Components

3d. 36" x 36" Slide Gate and Transition Pieces

3e. Hydraulic Actuator/HPU

3f. Air Vent and Hydraulic Line for Slide Gate

3g. Trash Rack

3h. Underwater Installation

Deliverable
As in the above task, deliverables include daily field reports and construction photos, Record Drawings, and the Construction Completion Report.

TASK 4 – CONSTRUCTION MANAGEMENT

Description of Task
Observe the work to ensure that work is being completed in conformance with the contract documents and intent of design. Provide administrative assistance with contract and invoices. Prepare Record Drawings and a Construction Completion Report as required by the SEO.

Method/Procedure

4a. Pre-Construction Meeting

4b. Prepare a construction observation plan for SEO review and approval.

4c. Review and process contractor invoices and change orders.

4d. Provide a full-time project representative to observe and document the work and to assess that work is completed correctly.

4e. Prepare Record Drawings of the completed work based on information provided by the contractor and a Construction Completion Report as required to meet SEO requirements.

Deliverable

Deliverables include hard copies of responses to invoice submittals, hard copies of daily field reports and construction photos, Record Drawings, and the Construction Completion Report.

BUDGET

			Labor	Direct Costs	Matching Funds	Total Cost
TASK 1: DESIGN						
Task	1a.	Hydraulic Gate Design & Detail	7,036.00	422.16		7,458.16
Task	1b.	Trash Rack Design and Detail	3,105.00	186.30		3,291.30
Task	1c.	Valve House Pre-fab metal Bldg	2,632.00	157.92		2,789.92
Task	1d.	Electrical Design & Detail	4,572.00	274.32		4,846.32
Task	1e.	Design Drawings	9,702.00	582.12		10,284.12
Task	1f.	Construction Docs and Specs	17,992.00	1,079.52		19,071.52
Task	1g.	Design Summary Report	10,672.00	640.32		11,312.32
Task	1h.	Engineer's Opinion of Probable Cost	6,366.00	381.96		6,747.96
Task	1i.	Progress Reports, Invoices & Meeting	2,748.00	164.88		2,912.88
			64,825.00	**3,889.50**	**-**	**68,714.50**
TASK 2: BIDDING AND PROCUREMENT *						
Task	2a.	Meeting between SEO & Engineer				2,000.00
Task	2b.	Engineer response to SEO				2,000.00
Task	2c.	Finalize drawings & specs for bidding				2,000.00
Task	2d.	Pre-bid meeting & site visit				2,000.00
Task	2e.	Evaluate bids				2,000.00
			-	**4,436.34**	**-**	**10,000.00**
TASK 3: CONSTRUCTION *						
Task	3a.	Barge & Lift Mobilization/Demobilization				50,000.00
Task	3b.	Barge and Lift Operations				8,000.00
Task	3c.	Demo of Internal Valve Components				1,000.00
Task	3d.	36" x 36" Slide Gate & Transition Piece				21,000.00
Task	3e.	Hydraulic Actuator/HPU				40,000.00
Task	3f.	Air Vent & Hydraulic Line for Slide Gate				13,500.00
Task	3g.	Trash Rack				15,000.00
Task	3h.	Underwater Installation				10,000.00
		Contingency				55,475.00
			-	**-**	**-**	**213,975.00**
TASK 4: CONSTRUCTION MANAGEMENT *						
Task	4a.	Pre-construction meeting				2,000.00
Task	4b.	Construction observation plan				2,000.00
Task	4c.	Review & process contractor submittals				5,000.00
Task	4d.	FT Project observation & documentation				51,000.00
Task	4e.	Record drawings & Completion report				10,000.00
			-	-	-	**70,000.00**
TOTAL COSTS						**362,689.50**

* Costs for Tasks 2, 3 and 4 are estimated costs - detailed costs for these items will be developed upon completion of design documents. Estimates provided by RJH Consultants, Inc.

Engineering & Design Costs

Project Personnel:	Senior Professional Grade 8	Senior Professional Grade 7	Senior Professional Grade 6	Grade 5	Grade 4	Grade 3	CADD Designer	Word Processing/ Admin	Total Hours	Cost
Hourly Rate:	$ 184	$ 169	$ 145	$ 130	$ 107	$ 97	$ 87	$ 67		
Task 1a	2	4			56				62	7,036.00
Task 1b	2	1			24				27	3,105.00
Task 1c	2	2			18				22	2,632.00
Task 1d	2	6	22						30	4,572.00
Task 1e	2	4			24		70		100	9,702.00
Task 1f	2	24			80	24		40	170	17,992.00
Task 1g	8	8		48				24	88	10,672.00
Task 1h	8	6			24	8		8	54	6,366.00
Task 1i	1	12						8	21	2,748.00
TOTAL Task 1										64,825.00

SCHEDULE

Task	Start Date	Finish Date
1: Design	Upon NTP *	NTP + 60 days
2: Bidding	Upon NTP	NTP + 90 days
3: Construction	NTP + 60-90 days	NTP + 180 days
4: Management	Upon NTP	NTP + 180 days

NTP = Notice to Proceed
* The ability to proceed immediately after NTP may be affected by weather conditions. Once begun, the project should take 90 – 180 days to complete.

The following exhibits are included:
Exhibit A: Mt. Pisgah Reservoir
Exhibit B: Mt. Pisgah Reservoir Topo
Exhibit C: DOWR Letter & Inspection
Exhibit D: RJH Consultants Outlet Inspection Report
Exhibit E: RJH Consultants Alternatives Evaluation
Exhibit F: RJH Drawing of Existing Outlet Works (to come)
Exhibit G: RJH Drawing of Alternative 1 (to come)
Exhibit H: Pisgah Reservoir and Ditch Company Decree
Exhibit I: Pisgah Reservoir and Ditch Company Bylaws
Exhibit J: Articles of Incorporation
Exhibit K: Letters of Support (more to come)

The above statements are true to the best of my knowledge:

Signature of Applicant:

Print Applicant's Name: Wayne Whittaker

Project Title: Mount Pisgah Dam/Wrights Reservoir Outlet Works Rehabilitation

Return an electronic version (hardcopy may also be submitted) of this application to:

Greg Johnson – WSRA Application
Colorado Water Conservation Board
1580 Logan Street, Suite 200
Denver, CO 80203
gregory.johnson@state.co.us

Printed 2/4/2002 to Word Perfect 9 0 format

THE PISGAH RESERVOIR AND DITCH COMPANY

ARTICLES OF INCORPORATION

FIRST. The corporate name and style of our said corporation shall be "THE PISGAH RESERVOIR AND DITCH COMPANY "

SECOND. The objects for which our said corporation is formed and incorporated are as follows:

1. (as amended 12/3/2001) To acquire by purchase, lease, or in any other manner and to operate, maintain and own water and water rights, reservoirs, canals, ditches, flumes, pipe-lines, laterals, pumping plants and equipment, and for the purpose of appropriating, storing, taking, conducting, exchanging, augmenting and distributing water for domestic, irrigation, municipal, industrial, recreational, piscatorial, and all other beneficial purposes, all as a mutual ditch company, and to do any and all other acts and things that may be necessary, expedient or incident to the enjoyment of and to carry out said objects and purposes and the objects and purposes hereinafter set forth

2. To acquire by purchase, lease, or in any other manner, real estate of every kind or description necessary or proper in connection with the business of said company, and to carry on its objects and purposes as herein set forth.

3. To acquire and to own, use, maintain, possess and enjoy any and all real estate, franchises, rights of way and easements which may be necessary, proper or desirable for any and all ditches, reservoirs, laterals, flumes, tunnels, embankments, pipes, pipe-lines, feeders, water ways, bridges and other accessories and appurtenances thereto for any of the objects or purposes of this company; and also to own and enjoy any and all tools, implements, machinery, fixtures and other personal property which shall be necessary or desirable for the advancement, promotion or convenience of any of the objects or purposes of this company.

4. (as amended 12/3/2001) To appropriate, convey, store, exchange, augment, distribute and supply water for domestic, irrigation, municipal, industrial, recreational, piscatorial and all other beneficial purposes.

5. To borrow money for the uses of the company and in furtherance of its objects and purposes and to mortgage or pledge in such manner as may be deemed advisable, the water, water rights, reservoirs, real estate, franchises, ditches, laterals, privileges and other property belonging to the company, or any part thereof, as security for the repayment of money so borrowed on such terms and conditions as may be deemed advisable.

6. To issue bonds and other obligations in payment for any property purchased or acquired by the company, or for any other object or purpose, in or about its corporate business; to mortgage or pledge stocks, bonds, or other obligations, or any property real, personal and mixed, including

franchises which may be acquired by the company, to secure any bonds or other obligations by it issued or incurred; to guarantee any dividends or bonds or contracts or other obligations; to make and perform contracts of every kind and description in connection with its corporate business or for the purpose of attaining or in furtherance of any of its objects and purposes; and to do any and all other acts and things which may be necessary, prudent or proper to carry on or to maintain its said corporate business

7. (as amended 12/3/2001) To acquire by lease, purchase or otherwise the Mount Pisgah Reservoir, so called, located in Teller County, State of Colorado, on Oil Creek or Four Mile and which covers part of the East half of the Northwest quarter and Lots one and two in Section 31, the East half of the Southwest quarter and Lots Three and Four in Section 30, and the Southwest quarter of the Northeast quarter, and the Southeast quarter of the Northwest quarter of Section 30, all in Township 14 South of Range 70 West of the Sixth Principal Meridian; also all prior rights to store water in said Reservoir acquired by impounding waters of Four Mile Creek therein and by the application thereof for all beneficial purposes.

8. To acquire by purchase or otherwise certain ditches or interest in ditches named and described in general decree of the District Court of Fremont County, Colorado, made and entered on the 3rd day of February, 1894, and by supplemental decree or decrees made and entered in said Court thereafter as follows, to-wit:

a. Garden Park Ditch Number 34;
b. Lucas Ditch Number 266;
c. Terry Ditch Number 36;
d. Aaron Ripley Ditch Number 37;
e. Cottage Rock Ranch Ditch Number 28;
f. Felch's West Side Ditch Numbers 349 and 424;
g. O'Brien Ditch Number 26;
h. Hunt Ditch Number 175;
i. West Ditch Number 226;
j. Lower Ditch Number 201;
k. Westall Ditch Number 192;

and also to acquire all or a part of the water decreed to said ditches, or any or more of them, respectively.

THIRD. (as amended 3/23/44) The term and existence of said corporation shall be extended in perpetuity.

FOURTH. The capital stock of said corporation shall be 50,000 shares and such shares shall be without nominal or par value, and every share of such stock shall be equal to every other share thereof

FIFTH. (as amended 12/3/2001) The number of directors of said company shall be not more than seven and the names of those who shall manage the affairs of the company, as such directors for the

first year of its existence are J. F. Underwood, V. H. Mann and J. C. Bailey.

SIXTH. (as amended 12/5/55) The principal office of the Company shall be kept at Rocky Ford, Otero County, State of Colorado, and the business of said company shall be carried on in the Counties of Otero, Teller and Fremont in said State.

SEVENTH. (as amended 3/6/89) The By-laws may only be amended by two-thirds vote of the outstanding shares either at an annual meeting of the shareholders or at a special meeting of the shareholders called for that purpose and only providing notice of such meeting or meetings and the proposed amendments have been given as provided for under "Shareholders Meetings" of the By-laws, paragraphs three through ten, inclusive.

IN WITNESS WHEREOF, the said incorporators have hereunto set their hands and seals, in triplicate, this 25th day of May A. D.1923.

s/ J. C. Bailey
J. F. Underwood
V. H. Mann

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BYLAWS

OF

THE PISGAH RESERVOIR AND DITCH COMPANY

OFFICES

1. The company shall maintain its principal offices for the transaction of its business at Rocky Ford, County of Otero, and State of Colorado. It may have other offices at such other places as the directors may from time to time determine.

SEAL

2. The company shall have a common seal, consisting of a circle having on its circumference the words, THE PISGAH RESERVOIR AND DITCH COMPANY and across its interior body the word SEAL.

SHAREHOLDERS MEETINGS

3. Shareholders meeting may be held at the principal office of the company at Rocky Ford, County of Otero, and State of Colorado, or at any other place within or without the State of Colorado designated by written consent of a majority of the shareholders entitled to vote thereat.

4. (as amended 3/5/90) The annual meeting of the shareholders shall be held on the first Monday in the month of December in each year for the purpose of electing a board of directors and transacting such other business as may properly be brought before the meeting.

5. The holders of the majority of the stock issued and outstanding and entitled to vote thereat, present in person, or represented by proxy, shall be requisite and shall constitute a quorum at all meetings of the shareholders for the transaction of business except as otherwise provided by law. If, however, such majority shall not be present or represented at any of the meetings of the shareholders, the shareholders entitled to vote thereat, present in person or by proxy, shall have power to adjourn the meeting from time to time without notice other than announcement at the meeting until the requisite amount of voting stock shall be represented, and business maybe transacted which might have been transacted at the meeting as originally notified.

6. (as amended 12/3/2001) The stockholders may vote either in person or by proxy and shall be entitled to one vote for each share of stock standing in their respective names and

the fraction of a share shall entitle the holder thereof to the same fraction of one vote. The voting for the board of directors may be done in the manner prescribed by the statute with reference to cumulative voting.

7. Written notice of the annual, regular and special meetings of the stockholders shall be mailed to each shareholder entitled to vote thereat at the address that appears on the books of the company, in the manner prescribed by law.

8. Special meetings of the shareholders for any purpose or purposes, unless otherwise prescribed by statute, may be called by the president, and shall be called by the president or the secretary or other person at the request in writing of the majority of the board of directors or at the request in writing of one or more share holders holding not less than 40% of the voting power of the corporation. Such request shall state the purpose or purposes of the proposed meeting.

9. Business transacted at all special meetings shall be confined to the objects stated in the call.

10. (as amended 12/3/2001) Deleted.

11. The property and business of this corporation shall be managed by the board of directors with not less than three nor more than seven members who need not be shareholders. They shall be elected at the annual meeting of the shareholders and each director shall be elected to serve until a successor shall be elected and shall qualify. The number of directors, pursuant to this provision in relation thereto contained in the Articles of Incorporation, may be increased to not more than seven by action of the directors according to these by-laws.

12. Without prejudice to the general powers and other powers conferred by these by-laws, the board of directors shall have the following powers, namely:

(a) From time to time to make and change rules and regulations, not inconsistent with law or these by-laws for the management of the company's business and affairs.

(b) To lease, purchase or otherwise acquire, in any lawful manner, for and in the name of the company, any and all real estate and other property, rights, or privileges, whatsoever deemed necessary or convenient for the prosecution of its business, and which the company is authorized to acquire, at such price or consideration and generally on such terms and conditions as it thinks fit.

(c) To sell or dispose of any real or personal estate, property, rights or privileges belonging to the company, except water rights, canal, or diversion dam, or any other part of the property used in the diversion and distribution of priorities owned by the company,

whenever in its opinion its interests would be thereby promoted.

13. It shall be the duty of the directors to cause to be kept a complete record of all their minutes and acts, and of the proceedings of the shareholders.

14. The board of directors shall supervise all officers, agents and employees and see that their duties are properly performed.

15. In addition to the powers and authorities by these by-laws expressly conferred upon them, the board may exercise all such powers of the corporation and do all such lawful acts and things as are not by statute or by the Articles of Incorporation or these by-laws directed or required to be exercised or done by the shareholders.

COMPENSATION OF DIRECTORS

16. Directors, as such, shall receive an amount to be fixed by the board of directors for each meeting of the board of directors attended and shall also receive all necessary and proper expenses incurred by them while on company business. Nothing herein shall be construed to preclude any director from serving the corporation in any other capacity and receiving compensation therefor.

MEETINGS OF THE BOARD

17. Stated meetings of the directors shall be held without notice on the day of the annual stockholders meeting immediately following each stockholders meeting, at the principal office of the company at Rocky Ford, Colorado.

18. Special meetings of the board may be called by the president on two days notice to each director, either personally, by mail or by telephone. Special meetings shall be called by the president or secretary or any board member in like manner on like notice on the written request of two directors.

19. Meetings of the board of directors may be held at any time or place fixed by a quorum thereof.

20. The transactions of any meeting of the board of directors, however called and noticed and wherever held, shall be as valid as though had at a meeting duly held after regular call and notice, if a quorum be present and if, either before or after the meeting, each of the directors not present sign a written waiver of notice of a consent to holding such meeting, or an approval of the minutes thereof. All such waivers, consents or approvals shall be attached to and made apart of the minutes of the meeting.

21. At all meetings of the board a majority of the directors shall be necessary and sufficient to constitute a quorum for the transaction of business, and the act of the majority

of the directors present at which there is a quorum shall be the act of the board of directors except as may be otherwise specifically provided by statute, the Articles of Incorporation, or these by-laws.

OFFICERS

22. The officers of the corporation shall be chosen by the directors, and shall be a president, vice-president, secretary and treasurer. The secretary and treasurer may be the same person, and the vice-president may hold at the same time the office of secretary or treasurer.

23. The board of directors, at its first meeting after each annual meeting of shareholders, shall choose a president, and vice-president from its own number, and a secretary and treasurer who need not be a member of the board.

24. The board may appoint such other officers and agents as it shall deem necessary, who shall hold their offices for such terms and shall exercise such powers and perform such duties as shall be determined from time to time by the board.

25. The salaries of all officers, employees and agents of the corporation, shall be fixed by the board of directors.

PRESIDENT

27. The president shall preside at all meetings of the shareholders and directors, and shall see that all orders and resolutions of the board are carried into effect.

28. He shall execute bonds, mortgages and other contracts requiring a seal, under the seal of the corporation, which have been first approved by the board of directors. When any instrument requires a seal it shall be attested by the signature of the secretary or assistant secretary.

VICE-PRESIDENT

29. The vice-president shall, in the absence or disability of the president, perform the duties and exercise the powers of the president, and shall perform such other duties as the board of directors shall prescribe.

SECRETARY

30. The secretary shall attend all sessions of the board and all meetings of the shareholders and record all votes in the minutes of all proceedings in a book to be kept for that purpose.

31. He shall keep the corporate seal of the corporation and the book of blank certificates of stock, fill up and countersign all certificates issued, and make the corresponding entries in the margin of such book on such issuance; and he shall affix the said corporate seal to all papers requiring a seal.

32. He shall keep a proper transfer book and a stock ledger in debit and credit form showing the number of shares issued to and transferred by any shareholder, and the dates of such issuance and transfer.

33. He shall give, or cause to be given, notice of all meetings of the shareholders and of the board of directors when such notice is required by law or by these by-laws to be given, and shall perform such other duties as may be prescribed by the board of directors or president, under whose supervision he shall be. He shall be sworn to the faithful discharge of his duty.

TREASURER

34. The treasurer shall have the custody of the corporate funds and securities and shall keep full and accurate accounts of receipts and disbursements in books belonging to the corporation, and shall deposit all moneys and other valuable effects in the name and to the credit of the corporation, in such depositories as may be designated by the board of directors.

35. He shall disburse the funds of the corporation as may be ordered by the board, taking proper vouchers for such disbursements, and shall render to the president and directors, at the regular meetings of the board, or whenever they may require it, an account of all his transactions as treasurer and of the financial condition of the corporation.

36. He shall give the corporation a bond, if required by the board of directors, in a sum, and with one or more sureties satisfactory to the board, for the faithful performance of the duties of his office, and for the restoration to the corporation, in case of his death, resignation, retirement, or removal from office, of all books, papers, vouchers, money and other property of whatever kind in his possession or under his control belonging to the corporation.

VACANCIES

37. If the office of any director, or of any officer or agent, one or more, becomes vacant by reason of death, resignation, retirement, or removal from office, or otherwise, the directors then in office, although less than a quorum, by a majority vote, or by a sole remaining director, may choose a successor, or successors, who shall hold office until his or their successors are elected at an annual or regular or a special meeting of the shareholders.

DUTIES OF OFFICERS MAY BE DELEGATED

38. In case of the absence of any officer of the corporation, or for any other reason that the board may deem sufficient, this board may delegate, for the time being, the powers or duties, or any of them, of such officer to any other officer, or to any director, provided a majority of the entire board concur therein.

CORPORATE STOCK

39. (as amended 3/6/89) Upon surrender of the certificate standing in the name of the Company, each stockholder of the Company shall receive a certificate or certificates for the number of shares of corporate stock to which he may be entitled to the extent of the percentage of ownership of the common capital stock that the stockholder presently owns in the CATLIN CANAL COMPANY and/or THE CANON HEIGHTS IRRIGATION AND RESERVOIR COMPANY. All fractional shares shall be computed to the nearest ten thousandth and rounded off on each certificate to the nearest one thousandth. For those stockholders owning shares in the CATLIN CANAL COMPANY, for each share of CATLIN CANAL COMPANY stock owned, the shareholder shall receive 1.1635 shares of THE PISGAH RESERVOIR AND DITCH COMPANY. For those stockholders owning shares in THE CANON HEIGHTS IRRIGATION AND RESERVOIR COMPANY, for each share of THE CANON HEIGHTS IRRIGATION AND RESERVOIR COMPANY stock owned, the shareholder shall receive 1.0086 shares of THE PISGAH RESERVOIR AND DITCH COMPANY. Each share of the capital stock of the said Company so issued shall be fully paid, and each certificate thereof shall be signed by the President and Secretary of the Company, under the seal thereof, and shall be numbered in the order in which it is issued.

TRANSFER OF STOCK

40. (as amended 3/6/89 and 12/3/2001) Section 1. The holders of any shares of the capital stock of THE PISGAH RESERVOIR AND DITCH COMPANY, their successors in interest or assigns, shall not be able to sell any shares of stock in the Company without also selling an equal percentage of ownership of shares of stock in either the CATLIN CANAL COMPANY or THE CANON HEIGHTS IRRIGATION AND RESERVOIR COMPANY. No requested transfer of stock will be deemed valid unless the request for the equivalent amount of CATLIN CANAL COMPANY stock or THE CANON HEIGHTS IRRIGATION AND RESERVOIR COMPANY stock accompanies such request. The purpose of this By-law is to prevent any attempt by any individual shareholder or a group of shareholders from selling or attempting to sell or hypothecate any shares of stock in this Company separate and apart for any purpose whatsoever. The only method by which said stock may be sold separate and apart is only upon a vote of the shareholders at a meeting called for that purpose and then only by a positive vote of a majority of the votes entitled to be cast at which a quorum is present.

Section 2. Any request for transfer of water represented by the shares in this Company shall be accompanied by an equal request for transfer of water represented by an equivalent ownership of shares in the CATLIN CANAL COMPANY or THE CANON HEIGHTS IRRIGATION AND RESERVOIR COMPANY and whether or not such requests are for inner-ditch or outer-ditch transfers, said transfers shall be solely subject to the discretion of the Board of Directors as to whether said transfer can be made without creating injury to the Company, the canal, or the other stockholders. In making such determination, the Board of Directors, upon receiving any such request, may require the requesting party to advance sufficient funds for engineering and legal expenses which the Company may incur in analyzing such request to enable them to make such determination. The Board of Directors may refuse to act upon any such request until such estimated costs have in fact been paid by the requesting party.

Section 3. Any attempt by any stockholder to either mortgage, sell, or hypothecate stock in this Company separate and apart from the equivalent ownership of shares in the CATLIN CANAL COMPANY or THE CANON HEIGHTS IRRIGATION AND RESERVOIR COMPANY, other than as provided in Section 1 above, shall be ineffective to require the Company to transfer any such stock independently of the provisions of these By-laws and all stock issued by this Company shall bear a legend upon which the same shall be stated so that these By-laws together with such legend shall become notice to any third persons, parties, individuals, partnerships, or corporations.

CLOSING OF TRANSFER BOOKS

41. The Board of Directors may close the transfer books, in its discretion, for a period not exceeding ten days preceding any meeting, annual or special, of the stockholders, or the day appointed for the payment of a dividend.

LOST CERTIFICATE

42. No new certificate shall be issued in case one is stated to be lost except (1) by order of the Board of Directors after proper legal evidence under oath of such lost certificate and a bond of indemnity satisfactory to the Board of Directors shall have been received and approved at a regular or special meeting, or (2) in the absence of a bond, if more than three years have elapsed since such stockholder, legal representative, or assignee has notified the corporation in writing that such certificate has been lost, mislaid, or destroyed, and such stockholder, legal representative, or assignee has paid all assessments levied by such corporation against such stock since such notification, the stockholder or his legal representative or assignee may file with the Secretary of said corporation a statement under oath that the certificate of stock has been lost, mislaid, or destroyed and that the certificate is the property of the person making such statement and has not been transferred or hypothecated by him, and demand the issuance of a duplicate certificate in accordance with these provisions.

Upon receipt of such demand, the corporation shall mail with postage prepaid a notice to all persons shown of record on the stub of the lost certificate, at the last known address of each such person, and further, shall publish at the expense of the person making such demand, at least once a week for five successive weeks the fifth publication being on the twenty-eighth day after the first publication, in a newspaper of general circulation in Otero County or if there is no newspaper in such County, then in such a newspaper of an adjoining County, a notice that such a demand has been filed with the corporation in accordance with these provisions, setting forth such demand in full and stating that said corporation will issue, on or after a date therein stated, following the last publication of said notice by at least thirty days, a duplicate certificate to the registered owner or his legal representative or assignee unless a contrary claim is filed with said corporation prior to the date stated in the notice.

If no claim of interest or ownership other than that made by the person filing such notice or his legal representative or assignee is filed with the Secretary of the corporation prior to the date stated in the notice, the corporation shall issue, on or after said date, a duplicate certificate to said person or his legal representative or assignee, and all rights under the original certificate shall immediately cease and determine and no person shall at any time thereafter assert any claim or demand against the corporation or any other person on account of such original certificate.

ASSESSMENT ON STOCK

43. Whenever it is deemed necessary to raise funds to keep the reservoir, dam, ditches, valves, gates and all related equipment in good repair, or it is deemed necessary to raise funds to pay any indebtedness theretofore contracted or the interest thereon, a majority of the stockholders thereof shall have power to make and levy an assessment on the capital stock thereof, to be levied pro rata on the shares of stock, payable in money or labor or both, for the purpose of keeping the property of this company in good repair and for the payment of any such indebtedness or interest thereon; provided that no assessment shall be made unless the question of making the same shall have been submitted to the stockholders at an annual meeting, or at a special meeting called for that purpose and a majority of the stock issued and outstanding represented either by the owner in person or by proxy, voting thereon, shall vote in favor of making such assessment, and in case said stockholders fail to hold such meeting or fail to make or authorize any such assessment by the first of April in any year, then the directors shall have power to make any such assessment at any regular or special meeting called therefor for such year.

In making and levying assessments against the stock as aforesaid the stockholders or the board of directors, as the case may arise, shall and they do have the power to fix the due dates of such assessment and the penalties for failure to pay said assessments if and when due and delinquent.

Shares of stock shall be deemed personal property and the shares of any stockholder

who becomes delinquent in the payment of any assessment ordered by the stockholders, or the directors, if such case may arise as aforesaid, may be forfeited and sold in the following manner:

A notice in writing shall be mailed to such stockholder at his last known post office address, which notice shall be signed by the president or secretary of the company, stating such delinquency, the amount due, and demanding payment thereof. Said notice shall also state that unless payment of such assessment be made on or before a certain date, which shall not be less than thirty days from date of such notice, the stock so delinquent shall stand forfeited to the Company, and will be sold pursuant to these by-laws. If payment be not made on or before the date specified the president or secretary shall then give notice by advertising in a weekly newspaper published in the County of Otero, in the State of Colorado, for not less than three weeks, that the shares of such delinquent stockholder will be sold for cash to the highest bidder at the office of the Company in Rocky Ford, Otero County, Colorado, on a day and hour in said notice specified, for the purpose of realizing such assessment. At the time and place aforesaid, the president or secretary shall offer said stock for sale, and sell the same for the highest cash price obtainable, not less than the amount of said assessment, with cost of said sale, and the proceeds of said sale over and above the amount due on said shares, including costs of sale, shall be paid to the delinquent stockholder. New certificate or certificates shall be issued to the purchaser, and the certificate or certificates of the delinquent stockholder shall be cancelled on the books of the Company. The remedy provided in this section for collecting delinquent and past due assessments is cumulative and shall not be deemed to take away or affect any other right which the Company now or may hereafter have relative to the collection of delinquent assessments. Providing however, that the delinquent stockholder may at any time before sale of stock have privilege of redemption by paying said assessment and all costs in the matter.

FISCAL AGENT FOR COLLECTION

43(a), (as adopted 3/6/89). For all stockholders who have equivalent stock in the CATLIN CANAL COMPANY, the CATLIN CANAL COMPANY is appointed as the fiscal agent for the collection of all assessments of this Company, which collection shall be on a pro rata basis with the collection of assessments of the CATLIN CANAL COMPANY. For all stock-holders who have equivalent stock in THE CANON HEIGHTS IRRIGATION AND RESERVOIR COMPANY, THE CANON HEIGHTS IRRIGATION AND RESERVOIR COMPANY is appointed as the fiscal agent for the collection of all assessments of this Company, which collection shall be on a pro rata basis with the collection of assessments of THE CANON HEIGHTS IRRIGATION AND RESERVOIR COMPANY.

Funds shall be receipted for when received by each Company and the pro rata proportion belonging to this Company shall be submitted monthly with a full accounting of the same.

INSPECTION OF BOOKS

44. The directors shall determine from time to time whether, and, if allowed, when and under what conditions and regulations, the accounts and books of the corporation (except such as may by statute be specifically open to inspection), or any of them, shall be open to the inspection of the shareholders, and the shareholders' rights in this respect are and shall be restricted and limited accordingly.

CHECKS

45. All checks or demands for money and notes of the corporation shall be signed by such officer or officers as the board of directors may from time to time designate.

FISCAL YEAR

46. The business year shall begin January 1st of each year.

DIRECTORS ANNUAL STATEMENT

47. The board of directors shall present at each annual meeting, and when called for by vote of the shareholders, at any special meeting of the shareholders, a full and clear statement of the business and condition of the corporation.

NOTICES

48. Whenever under the provisions of these by-laws notice is required to be given to any director, officer or shareholder, it shall not be construed to mean personal notice, but such notice may be given in writing, by mail, by depositing the same in the post office or letter box, in a postpaid sealed wrapper, addressed to such shareholder, officer or director at such address as appears on the books of the corporation, or, in default at other address to such director, officer or shareholder at the general post office in the city of Rocky Ford, Colorado, and such notice shall be deemed to be given at the time when the same shall be thus mailed.

49. Any shareholder, director or officer may waive any notices required to be given under these by-laws.

AMENDMENT OF BY-LAWS

50. (as amended 3/6/89) These By-laws may only be amended by two-thirds vote of the outstanding shares either at an annual meeting of the stockholders or at a special meeting of the stockholders called for that purpose and only providing notice of such meeting or meetings and the proposed amendments have been given as provided for under"Shareholders Meetings" of these By-laws, paragraphs three through ten, inclusive.

IN THE DISTRICT COURT OF THE ELEVENTH JUDICIAL DISTRICT
OF THE STATE OF COLORADO IN AND FOR FREMONT COUNTY

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In The Matter Of the Priority Of Water Rights in Water District No. 12 of The State of Colorado; And In The Matter Of The Petition Of The Pisgah Reservoir and Ditch Company for a Decree To Mount Pisgah Reservoir	4796 D E C R E E

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Now on this 13th day of January, A.D. 1928, the same being one of the regular juridical days of the November Term, A.D. 1927, of our said District Court, the above entitled matter comes on regularly for hearing on the petition of The Pisgah Reservoir and Ditch Company, a Colorado corporation, and in pursuance of the order made and entered herein on October 3, 1927 fixing the time for this hearing and prescribing the notice thereof to be given to all parties interested adversely to the said petitioner herein. The said petitioner appeared herein by its attorney, H. R. Waldo, Esquire; and no person or corporation appeared in opposition to petitioner or otherwise, nor has any protest or other objection been filed herein opposing the claims of said petitioner, although the time allowed therefor has now expired. Thereupon the said petitioner offered its evidence in open court in support of the allegations of its petition herein; and the court, having heard and considered the same and the argument of counsel thereon and being well and fully advised in the premises; doth now find;

1. - That at all times before this day the said petitioner herein has failed to offer any evidence in any of the proceedings heretofore had in this court in the matter of the Priority of Water Rights in Water District No. 12 of the State of Colorado, in support of the rights now claimed by it as fully set forth in its petition herein.

2. - That before giving or offering any evidence herein and before filing its said petition, the said petitioner made and filed in this court its statement of claim in form and substance as required by the laws of the State of Colorado in such case made and provided, setting forth its rights and claims in and to the waters in said Water District No. 12 which are herein involved, a true copy of which statement of claim appears as a part of the said petition herein.

3. - That before giving and offering any evidence herein, the said petitioner duly procured leave of this court so to do on terms as to notice to all parties interested adversely thereto more fully specified in the said order of this court made and entered herein on October 3, 1927, all as is required by the said laws of the State of Colorado.

4. - That petitioner has caused due and sufficient notice of its claims, and of the time and place fixed for the hearing thereon when any parties interested adversely thereto might appear and be heard in opposition thereto, to be given to all such parties interest adversely thereto in strict and complete accordance with the provisions of the said order herein of October 3, 1927; so that there is now vested in this court full and complete right and jurisdiction to adjudicate and determine the rights and priorities in said Water District No. 12 claimed by said petitioner.

5. - That said petitioner is now and at all times herein mentioned has been a corporation duly organized and existing under and by virtue of the laws of the State of Colorado.

6. - That petitioner is the owner of that certain reservoir known as the Mount Pisgah Reservoir and situated on Four Mile Creek, a tributary of the Arkansas River, in Water District No. 12 of the State of Colorado, and in Teller County, Colorado, and of all of the land overflowed by said reservoir and upon which the same is situated; that said reservoir is created by a dam across the natural stream bed of said Four Mile Creek situated in the E½ NW¼ of Sec. 31 in Twp. 14 S. of R. 70 W. of the 6th P.M. and with its east end located at or near a point from whence the NW corner of said Sec. 31 bears N. 46°46' 50" W. 2567.14 feet, from which point the center line of said dam runs S. 85°25' W. 642.93 feet to the Westerly end thereof; that said dam is approximately 74 feet high and forms a reservoir having a depth at high water mark of 65 feet, a surface area at such high water mark of 117 acres or 5,093,600 square feet, and a capacity when filled to such 65 foot level of 2743 acre feet or 119,549,500 cubic feet of water, and which inundates all or portions of the E½ NW¼, and Lots 1 and 2 of said

Section 31 and the E½ SW¼, SW¼ NE¼, SE¼ NW¼, and Lots 3 and 4 in Sec. 30 in the township and range aforesaid; and that said reservoir is the same reservoir particularly described in the plat of a resurvey thereof made by C.L. Milton and on file herein as Petitioners Exhibit No. 3, and is in substance in accordance with the original plat and statement of said Mount Pisgah Reservoir made by James Turnbull as amended by the Amended Plat of said reservoir made by The Garden Park Irrigation Company, the successor in interest of said James Turnbull, both of which plats were duly filed and are now of record in the office of the State Engineer of Colorado all as is required by the laws of the State of Colorado.

7 - That petitioner has duly succeeded to all the rights and interests of said James Turnbull and The Garden Park Irrigation Company in and to said Mount Pisgah Reservoir; that work was commenced on said reservoir by the original survey thereof on October 15, 1907 and was thereafter prosecuted to completion with all due and reasonable diligence by the said petitioner and its predecessors in interest; that ever since the completion of said reservoir water has been impounded and stored therein to its full capacity from the natural flow of said Four Mile Creek so far as the same has been available therefor without infringment on the rights of prior appropriators from said Four Mile Creek and said Arkansas River, and such water so stored therein has from time to time been released therefrom into the natural channel of said Four Mile Creek and thereafter diverted therefrom and from the said Arkansas River into which said Four Mile Creek flows and beneficially used in the irrigation of lands within the State of Colorado lying along said streams and below said reservoir and susceptible of irrigation therefrom which are otherwise inadequately supplied with water for the irrigation thereof and the production of crops thereon; and that by virtue thereof the said petitioner and its said predecessors in interest have duly appropriated in accordance with the laws of the State of Colorado, with priority date as of October 15, 1907, 2743 acre feet per year of the natural flow of said Four Mile Creek above said Mount Pisgah Reservoir for storage therein and release therefrom all as allowed by said laws of the State of Colorado, and said petitioner is now the owner of said appropriation and entitled to all the rights and privileges resulting therefrom.

8. - That there are large bodies of land within the State of Colorado lying along said Four Mile Creek and said Arkansas River and below said Mount Pisgah Reservoir which are susceptible of irrigation therefrom and which are inadequately supplied with water for the irrigation thereof from the normal natural flow of said streams, to-wit: More than 80,000 acres thereof; that all of the water so appropriated and so stored in said Mount Pisgah Reservoir has been and can be beneficially used in the irrigation of said land so inadequately supplied with water; and that there is no supply ditch for carrying water into said Mount Pisgah Reservoir, the water being carried directly therein by the natural stream of said Four Mile Creek.

It is, therefore, Considered, Ordered, Adjudged, and Decreed by this Court, as follows:

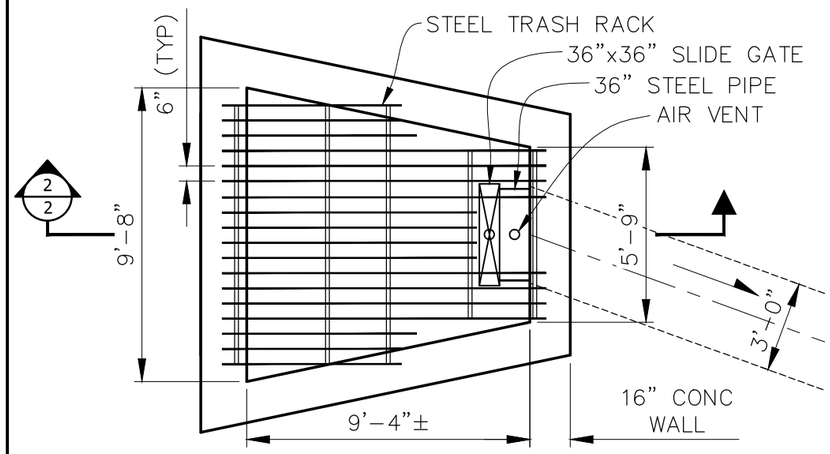
1. - That the said Mount Pisgah Reservoir is entitled to and is hereby awarded Arkansas River Storage Priority No. ____, the same being Four Mile Creek Storage Priority No. ____; with priority date as of October 15, 1907; and that under and by virtue thereof there be allowed to flow into said Mount Pisgah Reservoir and be impounded and stored therein each year sufficient of the natural flow of said Four Mile Creek to fill said reservoir to its said capacity of 2743 acre feet of water, in so far as the same may be available therefor without infringment on the rights of appropriators having appropriations with priority dates prior to said October 15, 1907.

2. - That The Pisgah Reservoir and Ditch Company, a Colorado Corporation and the petitioner herein, is now the owner of said Mount Pisgah Reservoir and of the rights and priorities appurtenant thereto as herein decreed; and that it and its successors and assigns are and shall be entitled to at will release from said Mount Pisgah Reservoir waters impounded therein in pursuance of this decree and allow the same to flow down the natural channel of said Four Mile Creek and said Arkansas River as permitted by the laws of the State of Colorado, and thereafter divert the same therefrom, less all losses in transit by seepage, evaporation, or otherwise to be determined as provided by the laws of the State of Colorado, and use the same in the irrigation of lands within the State of Colorado lying along said streams and susceptible of irrigation therefrom which are otherwise inadequately supplied with water for the irrigation thereof and the production of crops thereon.

3. - That the petitioner shall pay all the costs of this proceeding to be taxed against it herein, including the cost of extending the testimony for filing herein.

Done in Open Court.

By the Court: James L. Cooper, Judge.

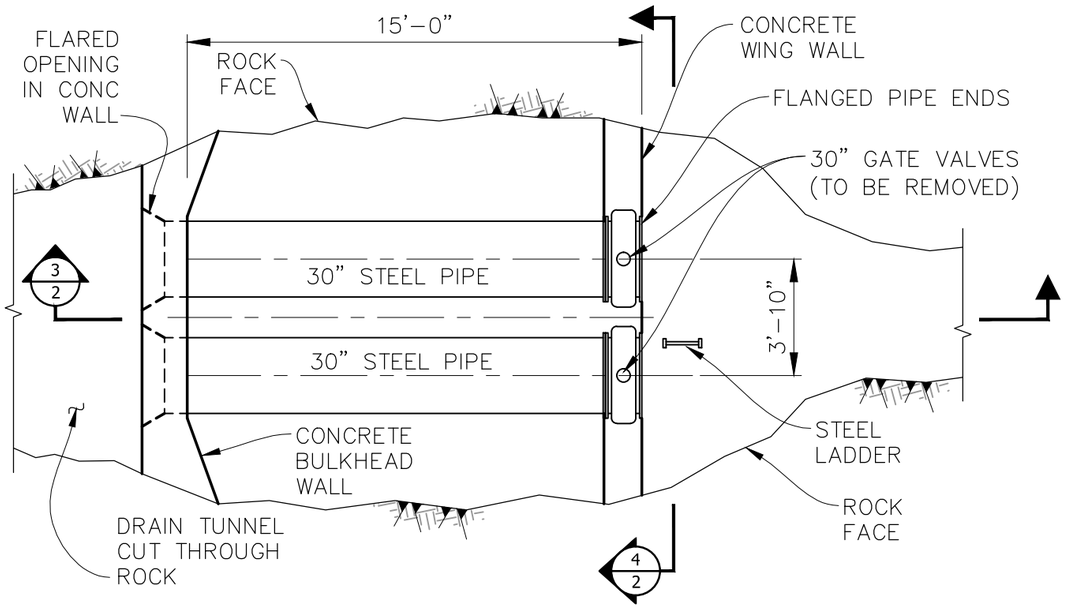


PLAN

INLET STRUCTURE

0 2.5 5 10 15

SCALE IN FEET



PLAN

VALVE ROOM

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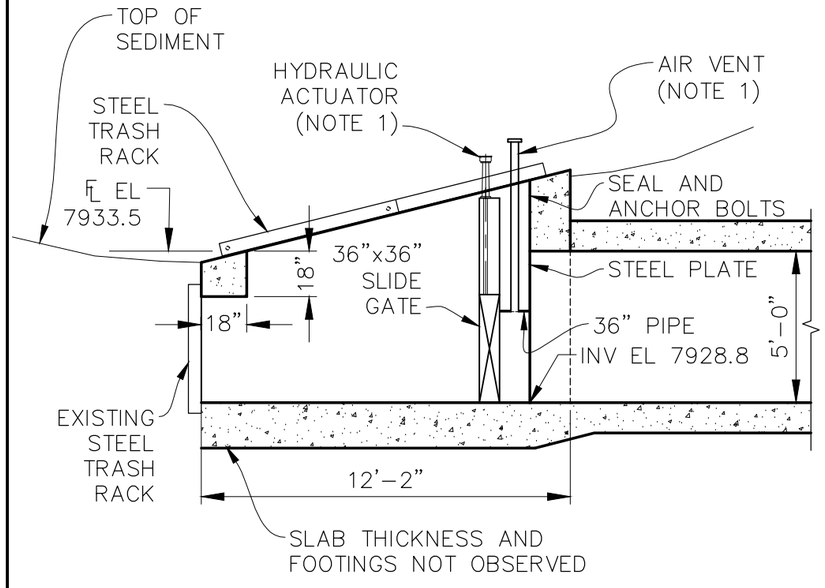
SCALE IN FEET

NOTES:

1. HYDRAULIC CONTROL LINES AND AIR VENT WILL EXTEND TO EXISTING VALVE HOUSE.



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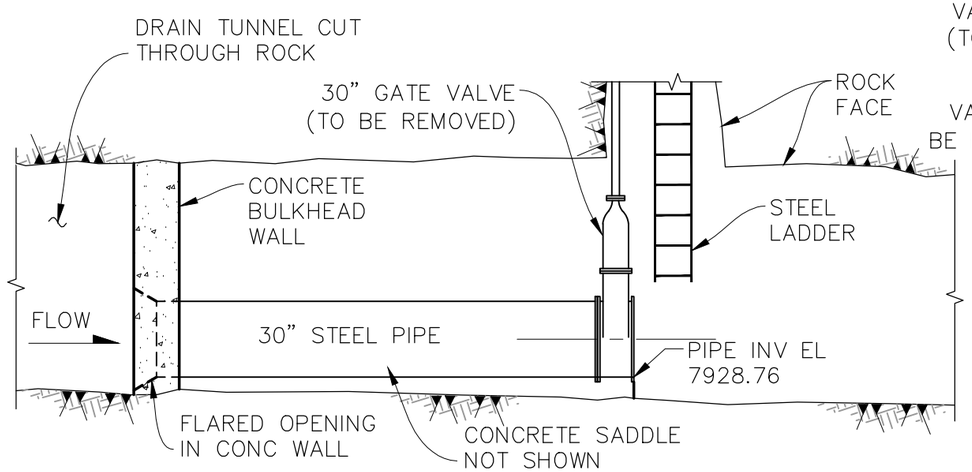

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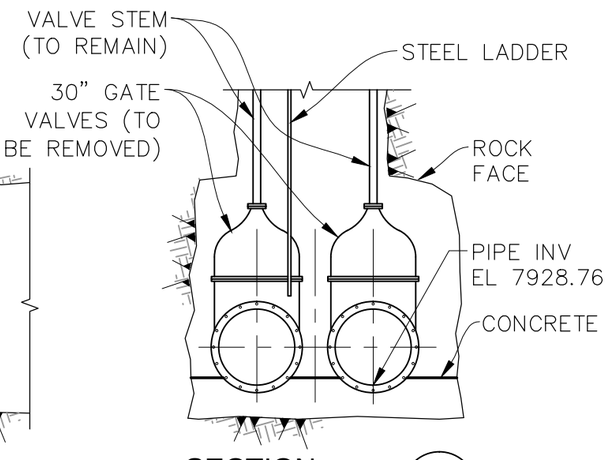

SECTION 4/2

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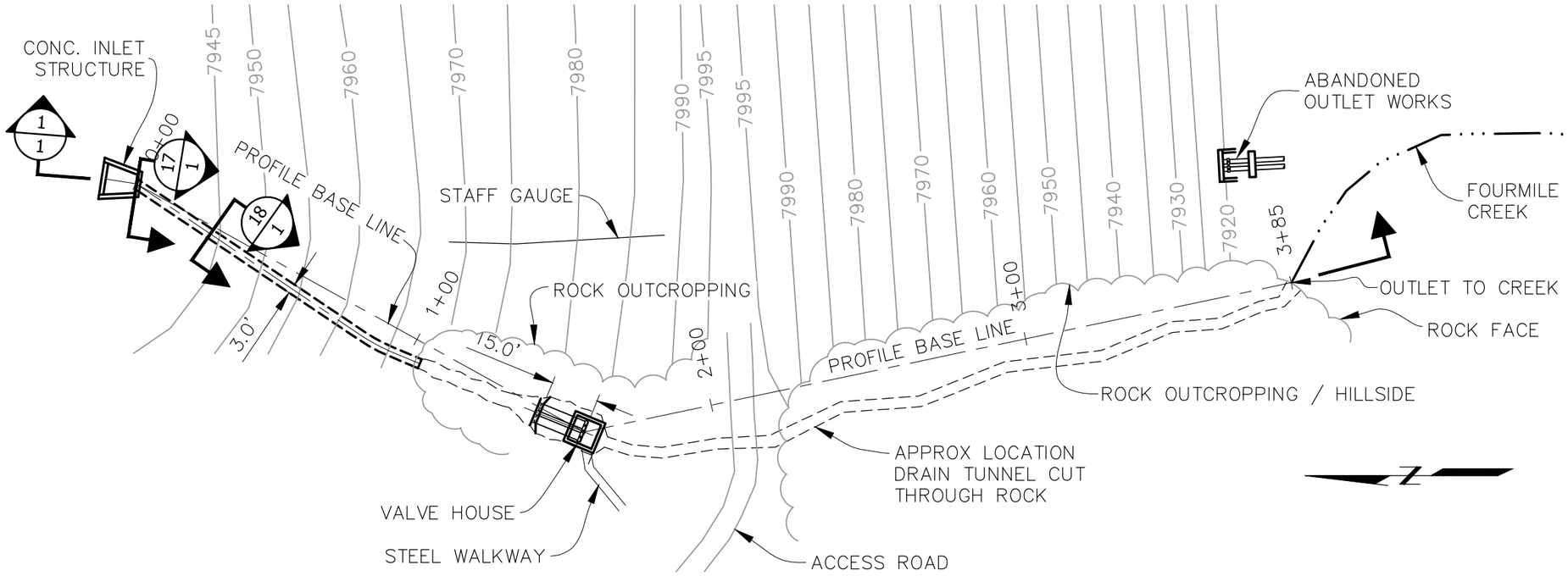
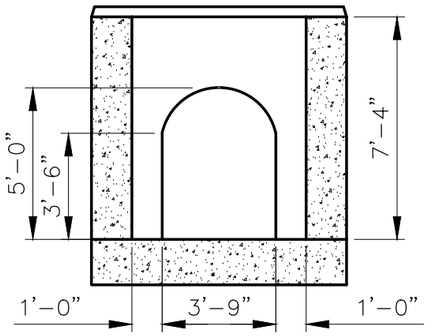
PISGAH RESERVOIR AND DITCH COMPANY	RJH CONSULTANTS, INC.	ALTERNATIVES EVALUATION MT. PISGAH DAM / WRIGHT'S RESERVOIR OUTLET WORKS	ALTERNATIVE 1
		PROJECT NO. 11119	November 2011 **Figure 2.1**



PLAN
EXISTING OUTLET WORKS



SECTION 17/1

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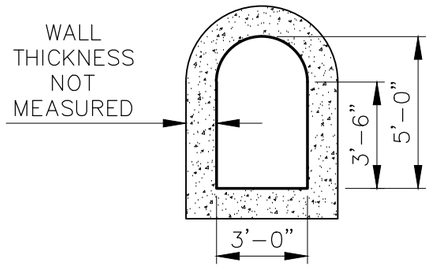

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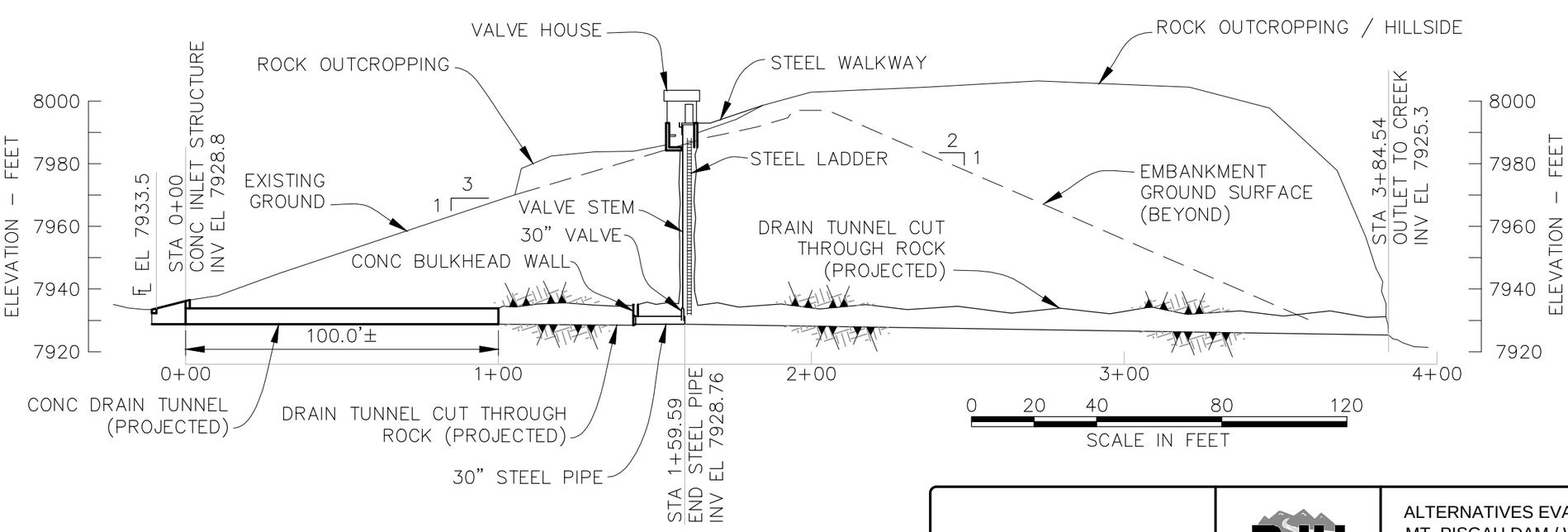

SECTION
EXISTING OUTLET WORKS
1/1

NOTES:

1. THE HORIZONTAL DATUM IS WGS 1984 AND THE VERTICAL DATUM IS NAVD27.
2. THE SIZE, SHAPE, AND CONFIGURATION OF THE OUTLET WORKS AND APPURTENANT FACILITIES WERE ESTIMATED BASED ON RJH SITE VISITS. DIMENSIONS ARE APPROXIMATE.

PISGAH RESERVOIR AND DITCH COMPANY	RJH CONSULTANTS, INC.	ALTERNATIVES EVALUATION MT. PISGAH DAM / WRIGHTS RESERVOIR OUTLET WORKS	EXISTING OUTLET WORKS PLAN AND PROFILE
		PROJECT NO. 11119	November 2011 **Figure 1.1**

RJH CONSULTANTS, INC.

GEOTECHNICAL AND
WATER RESOURCES ENGINEERING

ALTERNATIVES EVALUATION

MOUNT PISGAH DAM/WRIGHTS RESERVOIR OUTLET WORKS REHABILITATION

TELLER COUNTY, COLORADO

Submitted to

Pisgah Reservoir and Ditch Company
917 Elm Street
Rocky Ford, Colorado 81067

Submitted by

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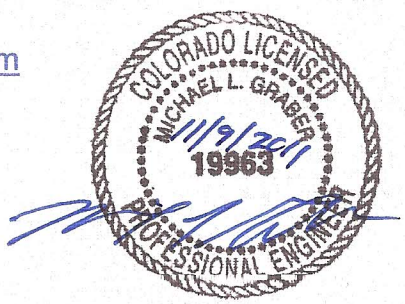
November 2011
Project 11119



Michael L. Graber, P.E.
Project Manager

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SECTION 1 - INTRODUCTION

1.1 Purpose

The purpose of this memorandum is to present the results of the alternatives evaluation for rehabilitation of the Mount Pisgah Dam/Wrights Reservoir outlet works.

1.2 Objectives

The objectives of the alternatives evaluation are as follows:

- Identify conceptual-level alternatives for rehabilitation of the outlet works including concepts for the intake structure, piping, and gate and valve configuration.
- Identify an appropriate new flow control type and configuration based on operational criteria and space limitations.
- Develop a planning-level opinion of probable cost for the components that are different between the various alternatives to support evaluation of cost differences between the alternatives.
- Identify the general advantages and disadvantages for each alternative.
- Identify preferred alternatives to move forward into final design.

1.3 Scope of Services

RJH Consultants, Inc. (RJH) performed the following services for this phase of the project:

- Performed an inspection of the outlet works including intake structure, horseshoe concrete tunnel, rockcut tunnels, concrete bulkhead, control valves, and 30-inch-diameter intake pipes.
- Performed a topographic survey of the dam cross section near the outlet works and key points of the outlet works.
- Obtained copies of the existing design drawings.
- Performed engineering analyses to identify conceptual-level sizes and configurations for each alternative.

- Performed simplified hydraulic analyses to evaluate hydraulic conditions (i.e., velocities, flow rates, etc.) for each alternative.
- Prepared conceptual-level plans and sections for each alternative.
- Estimated quantities of primary materials and estimated a planning-level cost to construct the non-similar components of each alternative. We did not develop an opinion of total probable project costs.
- Prepared this memorandum.

1.4 Background

Mount Pisgah Dam is a large, significant hazard earth embankment located in Teller County, about 12 miles from Cripple Creek, Colorado. The dam is located on Fourmile Creek and impounds Wrights Reservoir, with a capacity of approximately 2,192 acre-feet (ac-ft) supplied by direct inflow from Fourmile Creek. The embankment has an upstream slope at approximately 3H:1V, a crest width of about 10 feet, and a downstream slope of approximately 2H:1V.

According to SEO descriptions, the upstream slope was originally about 1.5H:1V with a reinforced concrete face when constructed around 1911. There was an upstream slope failure around 1928. After the slope failure, the upstream ends of the original outlet works were plugged, a new outlet conduit was constructed through the right abutment, and the upstream slope was rebuilt to about 3H:1V. The spillway is located at the left abutment and was enlarged in 1988. The crest elevation provides more than 10 feet of freeboard above the spillway elevation based on the June 2011 Colorado Office of the State Engineer (SEO) Engineer's Inspection Report.

Limited drawings available from the SEO office did not include as-built conditions and were not in agreement with RJH observations of the existing outlet works. An SEO condition of the outlet works assessment required dewatering and inspection of the outlet works and preparation of as-constructed drawings of the outlet geometry. RJH prepared as-constructed drawings based on RJH site visits and surveying performed on August 23 and 31, 2011. The drawings are submitted under separate cover.

The outlet works extends from Wrights Reservoir through Mount Pisgah Dam at the right abutment. A general plan and profile of the outlet works is shown on Figure 1.1. The outlet works consists of a series of tunnels and piping including a concrete intake structure and trashrack, a concrete intake tunnel, a rockcut tunnel intake with concrete bulkhead, two parallel 30-inch-diameter steel pipes with control valves, and a rockcut

drain tunnel discharging to Fourmile Creek at the downstream toe of the right abutment. The existing control valves appear to be knife-type valves and the current operating range of each valve is from closed to approximately 50 percent open due to poor operating valve condition. The owner reports that the two 30-inch-diameter valves have become increasingly difficult to operate and suffer from icing problems in the winter. Ice builds up on the valve stems, which requires the owner to use a heater to thaw out the valve stems if wintertime valve operation is needed.

The original outlet works consists of dual 16-inch-diameter cast-iron pipes that, following the upstream slope failure in 1929, were plugged or sealed at the upstream end and are no longer in use. The 16-inch outlets were not inspected or evaluated.

1.5 Existing Conditions

RJH performed a hydraulic evaluation of the existing outlet works to estimate the capability for meeting the SEO requirement for evacuating the top 5 feet of reservoir storage in 5 days. Based on the results of this analysis, the existing outlet works can evacuate the top 5 feet of reservoir storage in under 2 days. RJH assumed the valves will not open greater than about 50 percent as observed during site visits. The capacity of the existing outlet works at the normal maximum pool Elevation (El.) 7984.35 is estimated to be 194 cfs. The minimum capacity required to release the upper 5 feet of the reservoir within 5 days is estimated to be about 53 cfs.

Wrights Reservoir is operated as an irrigation reservoir and the water elevation varies throughout the year. The capacity of the outlet works is reduced during times of low water.

The valves and stems are intact but have more than 50 turns of slack in the gear driven operators. The limited operating range is most likely due to a lack of fully opening both valves on a routine basis, which has resulted in corrosion and gaulding of the operators in the unused range. The steel pipes were significantly corroded on both the interior and exterior of the pipe surfaces and sounding of the pipes indicated that the wall thickness was diminished and minimal. There did not appear to be any pipe joints. All concrete appeared in good condition and rockcut surfaces were smooth but irregular in section and shape. The rock appeared sound.

Stream channel erosion issues have been noted in Fourmile Creek downstream of the dam when significant flows have been released through the outlet works; however, this evaluation is limited in scope to the outlet works conduit and intake structure and RJH

did not evaluate the need for energy dissipation structures or downstream channel improvements.

1.6 Key Design Considerations

Based on RJH's understanding of project objectives, constraints, and site conditions, RJH has identified the following key considerations that will influence design of the project:

- The reservoir water level may or may not be lowered for construction. If the reservoir is lowered, sediment management may be difficult. Sediment-laden discharges may result in federal fines on the order of $20,000 per day.
- Based on the age and condition of the existing 30-inch-diameter intake pipes, the pipes will require lining, subject to the selected rehabilitation alternative. Lining would involve inserting a smaller diameter pipe into both of the 30-inch-diameter outlet pipes and grouting the resulting annular space between the pipes.
- The modified outlet works will be required to flush sediment deposits from the reservoir bottom.
- The existing outlet works pipes meet the SEO requirement for evacuating the top 5 feet of reservoir storage in 5 days. The modified outlet works should maintain as much of the existing capacity of the outlet works as possible.
- The outlet works will typically be operated at or near 30 to 40 cfs. Releases greater than 40 cfs are not typical and are generally short-term to minimize impacts to the downstream channel.
- Flow control will be provided by hydraulically-operated gates/valves at either the upstream end of the concrete tunnel or at the current valve location near the mid-section of the dam. Design of gates/valves will require throttling operations for variable flow control. Flow measurement in the outlet works pipes will not be required.
- The existing concrete intake structure will only be modified to the extent necessary for the different selected alternatives. It will not be removed and replaced with a new structure. The existing intake structure trashracks are unsuitable for re-use and must be replaced regardless of the design selected.

SECTION 2 - MODIFICATIONS

2.1 General

RJH developed three conceptual-level outlet works rehabilitation alternatives. The developed alternatives vary based on the flow control concept. Generally, the flow control concepts are upstream control only at the intake structure, control on the midsection of dam as it is controlled now, or a combination of both upstream and midsection flow control. A description of the rehabilitation components follows.

2.2 Pipe Lining

RJH selected steel pipe to use for slip lining the existing outlet works pipes in selected alternatives. The steel pipes will extend through the existing 30-inch-diameter steel pipes, which are about 17 feet long, assuming the bulkhead wall is 2 feet thick. It is our opinion that a minimum annular space of 1 inch should be maintained between the new and existing pipes to provide sufficient space to effectively insert the new pipe into the old pipe and provide adequate annular space for grouting. We anticipate that a 24-inch-diameter pipe will be used. RJH also considered the use of high-density polyethylene (HDPE) pipe. HDPE is more flexible and may cost less; however, flexibility is not required for the short, straight pipe alignments, and the cost difference will be negligible due to the short pipe length. HDPE may not perform well at relatively high flow velocities that may occur through the outlet pipes when the valves are exercised to the fully open position. For this reason, RJH selected steel pipe.

2.3 Flow Control

RJH developed three conceptual-level flow control alternatives and evaluated technical, operational, and economic considerations associated with each alternative. The alternatives are described as follows:

- Alternative 1 – Upstream Flow Control Only
  - Provide a slide gate on the existing intake structure
  - Extend hydraulic control lines and an air vent from the intake structure to a gate operator in the exiting valve house
  - Remove existing valve internal components
- Alternative 2 – Single Mid Dam Section Flow Control

  - Remove left valve internal components and grout the left pipe
  - Remove entire right valve, line the right pipe with 24-inch steel pipe, and install new knife valve on 24-inch pipe
  - Remove existing hydraulic control lines and extend new line to new gate control in the valve house
- Alternative 2A – Single Mid-Section Control with Bulkhead:
  - Similar to Alternative 2
  - Add a bulkhead at the intake structure so that the outlet works can be dewatered.
- Alternative 3 – Dual Mid Dam Section Flow Control
  - Excavate rock above left pipe for valve operator clearance
  - Remove both valves in entirety, line both pipes with 24-inch steel pipes, and install two new knife valves
  - Remove existing hydraulic control lines and extend new lines to new gate controls in the valve house
- Alternative 3A – Dual Mid-Section Control with Bulkhead:
  - Similar to Alternative 3
  - Add a bulkhead at the intake structure so that the outlet works can be dewatered.

The alternatives are shown on Figures 2.1 through 2.5.

Based on the simplified hydraulic analyses developed by RJH, the peak capacity of the outlet works configuration for each intake structure alternative is shown in Table 2.1. All alternatives meet the SEO requirement for releasing the top 5 feet of the reservoir within 5 days. In addition, all alternatives are capable of distributing 40 cfs operational releases with the reservoir nearly empty.

TABLE 2.1
PEAK OUTLET WORKS CAPACITY

Alternative	Peak Flow[1] with Pool El. 7984.35 (cfs)	Pool Elevation Required to Release 40 cfs[1] (ft)
Alternative 1	303	7931.6
Alternative 2 or 2A	130	7935.7
Alternative 3 or 3A	236	7932.2

Note:
1. Approximate peak flow. Assumes control gates/valves fully open.

SECTION 3 - EVALUATION

3.1 Cost Estimate

RJH developed a conceptual-level opinion of probable costs for each alternative. Cost estimates were developed by estimating quantities of primary elements of the work based on the conceptual-level design concepts and unit costs developed from the following sources:

- Published and non-published bid price data for similar work.
- R.S. Means Heavy Construction Cost Data for 2010.
- Manufacturer's budgetary price quotes.
- Our previous experience and judgment.

A summary of our cost estimate is presented in Table 3.1. A 35 percent contingency has been added to account for unforeseen items.

TABLE 3.1
ALTERNATIVES
OPINION OF PROBABLE CONSTRUCTION COSTS

Alternative	Opinion of Probable Construction Costs[(1)(2)] (OPCC, 2011) ($)
Alternative 1	214,000
Alternative 2	218,000
Alternative 2A	191,000
Alternative 3	287,000
Alternative 3A	260,000

Notes:
1. Costs rounded to $1,000.
2. Opinion of Probable Construction Costs does not include costs associated with insurance, design engineering, construction engineering, legal fees and permitting, and unscheduled items.

3.2 Evaluation of Alternatives

RJH evaluated the conceptual-level repair alternatives for technical, operational, and economic considerations. A summary of the advantages and disadvantages for each alternative is presented in Table 3.2.

TABLE 3.2
OUTLET REHABILITATION ALTERNATIVES
SUMMARY OF ADVANTAGES AND DISADVANTAGES

Alternative	Advantages	Disadvantages
Alternative 1	• Provides the greatest flow capacity • The mid dam section pipes remain in place where they could potentially be lined and fitted with valves in the future • Work could be performed under full or partial reservoir head, eliminating the need to drain the reservoir	• Construction requires a barge and lift with divers • Future gate access requires divers • Does not provide redundancy in flow control for outlet repairs or backup closure
Alternative 2	• Provides precise flow control even at small flow volumes	• Provides the lowest flow capacity • Parallel valve option is permanently closed • Does not provide redundancy in flow control for gate repairs or backup closure • Relies on the unknown structural integrity of the existing concrete bulkhead. If the bulkhead were to fail, it would result in draining the reservoir in an uncontrolled manner • Requires reservoir drawdown and stream diversion
Alternative 2A	• Provides precise flow control even at small flow volumes • Provides a means to dewater for valve maintenance • Work could be performed under full or partial reservoir head, eliminating the need to drain the reservoir • Would be the least expensive to construct	• Construction requires a barge and lift with divers • Provides the lowest flow capacity • Parallel valve option is permanently closed • Bulkhead closure may require crane and divers and will increase routine operation and maintenance costs by about $30,000 once every 10 years

Alternative	Advantages	Disadvantages
Alternative 3	• Provides precise flow control with a larger flow capacity compared to Alternative 2 • Preserves the existing schematic of two parallel valves	• Would be the most expensive to construct • Does not provide redundancy in flow control for gate repairs or backup closure • Relies on the unknown structural integrity of the existing concrete bulkhead. If the bulkhead were to fail, it would result in draining the reservoir in an uncontrolled manner • Requires reservoir drawdown and stream diversion
Alternative 3A	• Provides precise flow control with a larger flow capacity compared to Alternative 2 • Preserves the existing schematic of two parallel valves • Provides a means to dewater for valve maintenance • Work could be performed under full or partial reservoir head, eliminating the need to drain the reservoir	• Construction requires a barge and lift with divers • Bulkhead closure may require crane and divers and will increase routine operation and maintenance costs by about $30,000 once every 10 years

SECTION 4 - CONCLUSIONS

Based on work completed for the conceptual-level evaluation, we offer the following general conclusions:

- Flow control with throttling can be provided at either the upstream intake end of the outlet works or at the mid-section of the dam:
  - Slide gate on the upstream end of the outlet works
  - Knife gate valves at mid-section in the location of the existing valves
- A bulkhead could be added to provide an upstream control if mid-section flow control is selected. The bulkhead provides redundancy in case of emergency and allows for dewatering for outlet inspection and valve and tunnel maintenance. It also reduces construction costs by allowing the work to be performed without drawing down the reservoir. Due to the shape and condition of the intake, other methods to plug the intake for construction were not feasible.
- Existing pipes require lining if mid-section valves are used. Steel is appropriate for liner pipe because of installation conditions, sediment laden flows, and potentially high flow velocities.
- Underwater construction with a barge would cost less than constructing in the dry. The high cost for dry construction comes from building access over the sediment, stream diversion, and potential fines for sediment release.
- Advantages and disadvantages of the alternatives:
  - The least expensive alternative is Alternative 2A. This alternative provides the lowest flow capacity. Alternative 2A relies on the integrity of the existing concrete bulkhead wall near the mid-section of the outlet conduit.
  - The most expensive alternative is Alternative 3, which would essentially preserve the existing outlet works layout and operation.
  - Alternative 1 provides the greatest flow capacity. The mid-section pipes would remain in place and it would be possible to restore mid-section flow control in the future if desired.

SECTION 5 - RECOMMENDATIONS

Based on the work completed during the conceptual-level evaluation, we offer the following recommendations:

- Alternatives 2 and 3 should be eliminated from consideration because similar results can be obtained from Alternatives 2A and 3A, respectively, at a lower cost.
- Alternatives 1, 2A, and 3A are acceptable alternatives to move forward into final design. The preferred alternative should be selected by Pisgah Reservoir and Ditch Company based on the technical, operational, and economic trade-offs between these alternatives, as presented in this memorandum.

RJH CONSULTANTS, INC.

MEMORANDUM

Project 11119

Performed: August 23 & 31, 2011 **By:** Michael L. Graber, P. E. 11/9/2011

CLIENT: Catlin Canal Company

SUBJECT: Mt. Pisgah Dam and Reservoir Outlet Inspection

Section 1 Background

The original dam was constructed in 1911 with dual 16-inch-diameter outlet pipes that had downstream control gate valves installed at the toe of the dam. In 1928 a slide on the upstream slope of the dam covered the intake of the dual 16-inch pipes with embankment material rendering the outlet unusable. A rehabilitation approach was developed in November 1928 by H.I. Reid, a consulting engineer from Colorado Springs. The rehabilitation approach included blowing a hole in the 16-inch pipes with "powder" to drain the reservoir and then constructing a tunnel through the right (west) abutment of the dam. A plan prepared by H.I. Reid indicated that the majority of the upstream portion of the tunnel was to be constructed of concrete in the shape of a horseshoe, which was 5 feet high and 3 feet wide with a grated intake structure. Water in the concrete tunnel flowed into two 30-inch-diameter gate valves located in a rockcut tunnel near the transverse midpoint of the dam. A vertical rockcut shaft was shown to the dam crest in which the valve stems and operators were to be located. The valves discharged into an open rockcut tunnel, which was to be excavated to daylight.

The 16-inch valves were to be plugged and then abandoned once the new outlet works was complete and functional.

Section 2 As-Constructed Outlet

There are no known as-constructed plans for the new outlet works that were prepared after the construction was completed in 1929. RJH measurements and inspection of the outlet works discovered some significant changes made to the original plan prepared by H.I. Reid in 1928. The intake structure had both low level and upper level intake openings that were covered by trashracks. The original plan indicated only a upper level intake opening. The current inflow control elevation of the intake structure is at Elevation (El.) 7928.8 and the maximum reservoir elevation, which corresponds to the emergency spillway flowline elevation, is at El. 7984.35.

The horseshoe tunnel was generally constructed to the cross section dimensions shown in the original 1928 plan but the length and alignment were found to be significantly different. The intake structure was generally located so that it was parallel to the longitudinal axis of the dam but the tunnel was not perpendicular to the intake structure having a skewed alignment of approximately 15 degrees to the right (southwest). The tunnel followed this alignment for approximately 100 feet where it began a circular curve to the left (southeast). After the curve, there was a short tangent section which terminated in an open rockcut tunnel. A short rockcut tunnel section downstream of the concrete horseshoe tunnel of

approximately 40 feet terminated at a concrete bulkhead wall which had two, 30-inch-diameter intake pipes through the bottom of the wall. The rockcut tunnel made a gradual transition from the horseshoe tunnel termination to an open chamber approximately 7 feet wide by 10 feet high.

The 30-inch-diameter pipes were approximately 15 feet in length and supplied the two, 30-inch-diameter gate valves located in the vertical rockcut shaft and downstream tunnel. The valves discharged directly into the downstream rockcut tunnel.

The downstream rockcut tunnel was generally 5 feet wide by 7 feet high but had four locations where the tunnel width narrowed to 42 inches. The alignment was not straight but veered right and left at approximate 15 to 20 degree angles about every 40 feet. The daylight discharge to the stream channel was visible at approximately 40 feet from the exit point.

GPS survey points were taken at the tunnel intake, the center of the vertical valve shaft, and at the daylight discharge of the downstream tunnel. All other measurements are approximate.

Section 3 Outlet Inspection

3.1 Intake Structure

The exterior of the intake structure was completely surrounded by silt and located in a depression in the reservoir bottom. The top of the deposited silt is approximately 7.6 feet above the structure control section. The center section of the top trashrack was removed and laying on top of the silt deposits, approximately 50 feet to the northeast of the intake structure. There is a low-level intake opening with trashrack on the upstream side of the intake structure. The opening extends from the floor of the intake structure upward approximately 2.5 feet and extends across the front of the structure. The opening has a trashrack across it and is completely silted in with no flow coming through the opening.

Intake structure concrete was generally in good condition, having no apparent cracks, displacement, or spalling. Chipped concrete was noted on the right (west) side of the horseshoe shaped concrete intake tunnel. The floor of the intake structure was completely covered with silt and silt-laden inflow and was not visible at the time of inspection. Inspection of the floor was completed using a wooden dowel to probe and "feel" the floor. This inspection procedure found no cracks or holes in the intake structure floor. Based on the inspection, the intake is considered serviceable and sufficient for consideration of reuse in rehabilitation alternatives development.

The trashrack was found to be in very poor overall condition displaying advanced corrosion on all surfaces that has reduced steel framing member cross sections. The trashrack likely does not meet current design criteria for opening sizes and flow velocities through the rack and is considered unusable for reuse in the rehabilitation alternatives development.

3.2 Concrete Intake Tunnel

As previously described, the concrete intake tunnel is horseshoe shaped in cross section, 3 feet wide by 5 feet high, and has a concrete floor. The tunnel is not perpendicular to the intake structure or the embankment and follows a southwest bearing for approximately 100 feet where it makes a gradual circular turn in a more southerly direction for approximately 25 feet. The concrete tunnel then terminates and is followed by a rockcut tunnel for

approximately 40 feet where the concrete bulkhead upstream of the control valves is located.

The tunnel surfaces and concrete were found to be in generally good to satisfactory condition. There were a number of cracks and small holes observed in the tunnel walls that displayed seepage flows that will require repair to return the concrete to a more watertight and acceptable condition. The floor of the tunnel was not visible and completely covered in an approximately 8 inches of silt and silt-laden flow. Additional inspection of the floor is recommended after the silt has been flushed from the tunnel and once upstream flow control is established during the rehabilitation process.

3.3 Rockcut Intake Tunnel From Concrete Tunnel to Bulkhead

This section of the outlet works tunnel was typical for what would be expected for tunnel bored using handheld equipment and completed in 1929. The cross section was not uniform with many jagged rock edges and points. The exposed rock face was found to be sound with no lose or displaced rock material. The tunnel floor was generally smooth and even.

3.4 Rockcut Intake Tunnel Concrete Bulkhead

The bulkhead concrete was found to be smooth on both the upstream and downstream side with no cracks or holes in the concrete. Joints against the rockcut tunnel were tight and the rock face at the joints was sound. Previously documented inspections by the SEO found little or no seepage through the bulkhead on the downstream side under full reservoir head. The current control configuration with the valves on the downstream side of the bulkhead relies on the pressure integrity of the bulkhead and the 30-inch pipe penetrations through the bulkhead. If the bulkhead were to fail and lose pressure integrity, the result would be an uncontrolled reservoir release.

3.5 30-Inch-Diameter Intake Pipes From Bulkhead to Control Valves

The 15-foot-long pipe sections from the downstream end of the bulkhead to the control valves were found to be severely corroded, thin in wall thickness, and generally in very poor overall condition. The bottom half of the pipes was bedded in concrete. If the pipes are to be used for outlet rehabilitation where pressure integrity is required, replacement or lining will be required.

3.6 Control Valves

The two 30-inch-diameter control valves will only open approximately 50 percent before the operators become very difficult to turn and the operators have more than 50 turns of slack before the valve stems begin to move. The right valve stem is relatively straight and vertical but the left valve stem is bent near the bottom of the vertical rockcut shaft so that it can line up with the left valve, which is not located under the vertical rockcut. Previously documented inspections by the SEO found little or no seepage through the valve faces and seats under full reservoir head. The valves and operators will require replacement or repair if they are to be used for rehabilitation of the outlet works.

3.7 Downstream Rockcut Discharge Tunnel

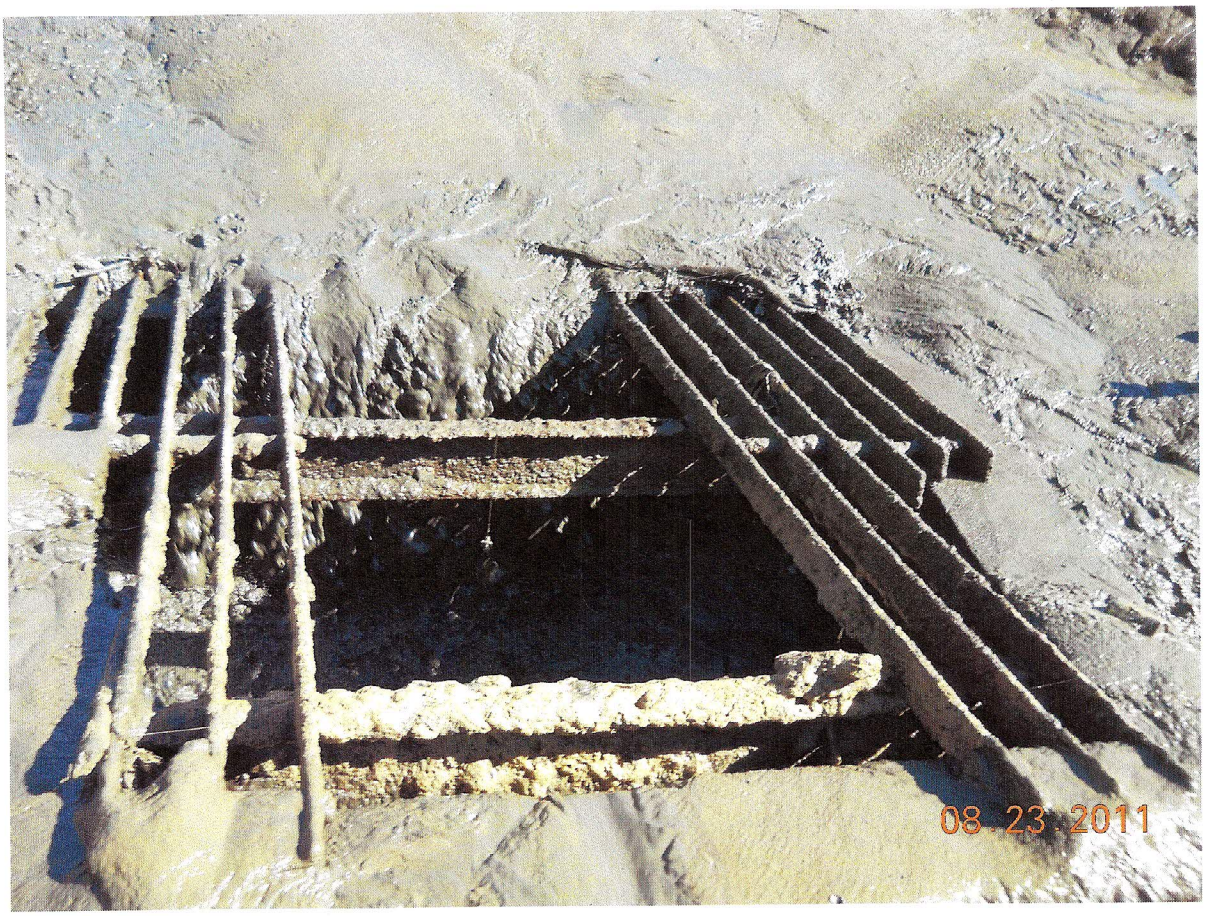
The downstream rockcut discharge tunnel was found to be similar in cross section as the upstream tunnel but undulating in alignment. The floor of the tunnel was found to be very irregular with holes and high points differing by as much as 2 vertical feet. The rock

surfaces were jagged but sound and no fractured or loose rock was observed. The tunnel discharges directly into the stream channel below the dam, which has a rock bottom and no indications of past erosion.

Section 4 Photographs

4.1 Intake Structure

View of trashrack looking upstream from the upstream slope.



View of trashrack looking upstream from the upstream slope.

View of horseshoe tunnel intake looking downstream.

View of silted in lower level intake and trashrack looking upstream.

View of downstream side of control valves.

View looking upward into the vertical rockcut shaft for valve stems.

COPY Board 7/18/11

DEPARTMENT OF NATURAL RESOURCES

DIVISION OF WATER RESOURCES

John W. Hickenlooper
Governor

Mike King
Executive Director

Dick Wolfe, P.E.
Director & State Engineer

Steven J. Witte, P.E.
Division Engineer

July 8, 2011

Mr. Greg Williams
Pisgah Reservoir and Ditch Co.
P.O. Box 352
Rocky Ford, CO 81067

When replying, please refer to:
MOUNT PISGAH DAM:
Water Division 2, DAMID 120129

SUBJECT: Transmittal of Dam Safety Inspection Report

Dear Mr. Williams:

As you know a dam safety inspection of the above-referenced dam was performed on June 28, 2011, in accordance with Colorado Revised Statute 37-87-107, which assigns to the State Engineer's Office the responsibility for determining the safe storage levels for all reservoirs in this state. The enclosed inspection report (2 copies) summarizes the conditions observed during the inspection and identifies actions required to improve the condition and extend the useful life of the structure. Please review the report and implement all recommendations listed in the section entitled, "Items Requiring Action by Owner to Improve the Safety of the Dam" on page 2 of the reports. Please sign, date, and return one copy of the inspection report and retain the other copy for your files and future reference.

The last Emergency Action Plan that we have on file for Mount Pisgah Reservoir is dated 1994. If a more recent EAP was prepared, please provide a copy to our office. Otherwise, the EAP needs to be updated. Please visit the SEO website (http://www.water.state.co.us/damsafety/) for new guidelines for preparing an EAP and a sample Microsoft Word EAP template to assist you.

Please contact me at your earliest convenience if you have questions or comments regarding the information contained in the report or if you require assistance with any dam-safety related issues.

Sincerely,

Mark A. Perry, P.E.
Dam Safety Engineer

Encl.

cc: Denver File
Division 2 File Pueblo
Steve Witte, Division Engineer
Brian Sutton, Water Commissioner

ENGINEER'S INSPECTION REPORT

INSPECTOR: MP3

OFFICE OF THE STATE ENGINEER - DIVISION OF WATER RESOURCES - DAM SAFETY BRANCH
1313 SHERMAN STREET, ROOM 818, DENVER, CO 80203, (303) 866-3581

DAM NAME:	MOUNT PISGAH	T: 140S R: 0700W S: 31	COUNTY: TELLER			DATE OF INSPECTION:	6/28/2011
DAM ID:	120129 YRCompl: 1911	DAM HEIGHT(FT):	69.0	SPILLWAY WIDTH(FT):	60.0	PREVIOUS INSPECTION:	9/29/2009
CLASS:	Significant hazard	DAM LENGTH(FT):	610.0	SPILLWAY CAPACITY(CFS):	6073.0	NORMAL STORAGE (AF):	2250.0
DIV:	2 WD: 12	CRESTWIDTH(FT):	12.0	FREEBOARD (FT):	11.0	SURFACE AREA(AC):	124.0
EAP:	10/21/1994	CRESTELEV(FT):	8034.8	DRAINAGE AREA (AC.):	46460.0	OUTLET INSPECTED:	9/20/1990

CURRENT RESTRICTION: -- NONE --

OWNER:	PISGAH RES. AND DITCH COMPANY	OWNER REP.:	GREG WILLIAMS
ADDRESS:	P. O. BOX 352	CONTACT NAME:	HOWARD STONE
	ROCKY FORD CO 81067-0000	CONTACT PHONE:	(719) 689-2277

INSPECTION PARTY :	Greg Williams, Howard Stone	Dustinn Valdez	Mark Perry
REPRESENTING :	Mt Pisgah Co./Catlin Canal	DWR	Colorado Dam Safety

FIELD CONDITIONS OBSERVED

WATER LEVEL: BELOW DAM CREST _____ FT. Above Spillway _____ FT. GAGE ROD READING 33.32

GROUND MOISTURE CONDITION: [✓] DRY [ ] WET [ ] SNOWCOVER OTHER _____

DIRECTIONS: MARK AN X FOR CONDITIONS FOUND AND UNDERLINE WORDS THAT APPLY

UPSTREAM SLOPE

PROBLEMS NOTED [ ] (0)NONE [ ] (1)RIPRAP - MISSING, SPARSE, DISPLACED, WEATHERED [ ] (2) WAVE EROSION - WITH SCARPS

[ ] (3) CRACKS WITH DISPLACEMENT [ ] (4) SINKHOLE [ ] (5) APPEARS TOO STEEP [ ] (6) DEPRESSIONS OR BULGES [ ] (7) SLIDES

[ ] (8) CONCRETE FACING - HOLES, CRACKS, DISPLACED, UNDERMINED [✓] (9) OTHER

- top ~1-2 ft of the slope is steep (~1:1) down to a 3-ft high stone parapet wall. Below the wall the upstream slope is ~3H:1V. Reportedly the slope becomes less steep farther down the slope (GH 30-ft?) when the owner had to change the grade of the new slant gage.
- The original slope (C-55) was 1.5H:1V with reinforced concrete face. There was an upstream slope failure around 1928 and the upstream slope was rebuilt to ~3H:1V. According to the specifications dated May 11, 1929, provided by your office there was a cutoff trench constructed along the new upstream toe that went down to bedrock or impervious clay. From Stations "2+50 to 5+50" the specifications allowed timber or steel sheet piling to be used in lieu of the trench, but it is not known whether the sheet piling was in fact used.
- Granite riprap appears durable and in good condition.
- There is a stand of willows on the left side. Continue to control them as needed.

CONDITIONS OBSERVED: [ ] Good [X] Acceptable [ ] Poor

CREST

PROBLEMS NOTED [ ] (10) NONE [ ] (11 RUTS OR PUDDLES [ ] (12) EROSION [ ] (13) CRACKS - WITH DISPLACEMENT [ ] (14) SINKHOLES

[ ] (15) NOT WIDE ENOUGH [ ] (16) LOW AREA [ ] (17) MISALIGNMENT [ ] (18) IMPROPER SURFACE DRAINAGE [✓] (19) OTHER

- approximately 10-ft wide. Crest appears to be level and straight. No depressions, holes or changes in alignment were observed.
- crest should be monitored for subsidence along the alignment of the old outlet conduits.
-According to the 1988 C-1690 as-built plans the minimum freeboard after construction was ~11.4-ft to a low point on the crest. According to the C-1690 plans the crest was overbuilt and the design freeboard was 10.9 ft. During the inspection we shot the dam crest at 54.8' (new slant gage datum) and the spillway crest at 43.35 for a freeboard of 11.45-ft. OK.
- Prior to the C-1690 construction it appears the crest was very uneven after it had been leveled according to the 1928 specifications. Since 1988 it appears the crest is stable.

CONDITIONS OBSERVED: [ ] Good [X] Acceptable [ ] Poor

DOWNSTREAM SLOPE

PROBLEMS NOTED [ ] (20) NONE [ ] (21) LIVESTOCK DAMAGE [ ] (22) EROSION OR GULLIES [ ] (23) CRACKS - WITH DISPLACEMENT [ ] (24) SINKHOLE

[ ] (25) APPEARS TOO STEEP [ ] (26) DEPRESSIONS OR BULGES [ ] (27) SLIDE [ ] (28) SOFT AREAS [✓] (29) OTHER

- The downstream slope appears to be ~2H:1V. The original 1911 C-55 plans shows a 2H:1V and there is no indication the downstream slope has ever been modified.
- Remove brush and large vegetation from both left and right groins.
- An access road cuts along the downstream toe of the dam approximately 200-ft right of the left end of the dam. Below the access road there is a ~5-ft high stone retaining wall along the spillway return channel. This section of the downstream slope should be monitored for local instability, especially if there is spillway flow that could saturated the soils behind the stone wall.
- numerous rodent holes were observed. Control rodents.
- No cracking, depressions or other signs of distress or instability were observed.

CONDITIONS OBSERVED: [ ] Good [X] Acceptable [ ] Poor

SEEPAGE

PROBLEMS NOTED ☐ (30) NONE ☐ (31) SATURATED EMBANKMENT AREA ☐ (32) SEEPAGE EXITS ON EMBANKMENT

☐ (33) SEEPAGE EXITS AT POINT SOURCE ☑ (34) SEEPAGE AREA AT TOE ☑ (35) FLOW ADJACENT TO OUTLET ☐ (36) SEEPAGE INCREASED / MUDDY

DRAIN OUTFALLS SEEN ☑ No ☐ Yes Show location of drains on sketch and indicate amount and quality of discharge. ☐ (37) FLOW INCREASED / MUDDY ☐ (38) DRAIN DRY / OBSTRUCTED

☑ (39) OTHER

- Ponded water was observed downstream of the old outlet conduit endwall. This is a historical seepage area. We found the V-notch weir to be in poor condition -- bowed, clogged with weeds, and needs a staff gage. The weir should be reset and this seepage should be monitored regularly for flow quantity and turbidity and recorded along with reservoir gage height, especially at high reservoir levels.
- Thank you for providing our office with the specifications from the dam rehabilitation after the 1928 upstream slope failure. According to the specifications the upstream damaged portion of the two original 16" dia. C.I. conduits were removed and the "sound" portion of the pipes were left in place and was either sealed with cast iron stoppers, leaded in, or the upstream ends were filled with concrete plugs depending on which way the bell ends were found to be facing. We have no record of which was actually done. Regardless it sounds as if the remainder of the two C.I. pipes were left inside the dam and they are now around 100 years old. According to the C-55 plans the original upstream slope was 1.5H:1V. The present slope was extended out at ~3H:1V. The C-55 plans show the crest at 76-ft above the oringinal outlet pipes. Therefore we can say that the plugs in the old conduits would be a minimum of 114 ft (76' x 1.5) into the dam from the present upstream slope and likely more because some sections of the conduits may have been removed if they were damaged in the 1928 slope failure. This would still put the upstream end of the old conduits at about the upstream 1/3 of the dam and there are likely significantly pore pressures along the old conduits. The conduits should be monitored carefully for increased seepage and external signs of distress. Consider inspecting the conduits and planning to grout them or otherwise properly abandon them in the long term.
- Very dry conditions have left the grass on the dam brown and would make seepage very obvious. Besides the green wet area mentioned above at the old outlet outfalls no indications of seepage were observed on the embankment or at the downstream toe or the groins.

CONDITIONS OBSERVED: ☐ Good ☒ Acceptable ☐ Poor

OUTLET

PROBLEMS NOTED ☐ (40) NONE ☐ (41) NO OUTLET FOUND ☐ (42) POOR OPERATING ACCESS ☐ (43) INOPERABLE

☐ (44) UPSTREAM OR DOWNSTREAM STRUCTURE DETERIORATED (45) OUTLET OPERATED DURING INSPECTION ☐ YES ☑ NO

INTERIOR INSPECTED ☑ (120) NO ☐ (121)YES ☐ (46) CONDUIT DETERIORATED OR COLLAPSED ☐ (47) JOINTS DISPLACED ☐ (48) VALVE LEAKAGE

☑ (49) OTHER

- There was a 5 cfs release through the tunnel so we were not able to inspect it.
- Valves and valve house are old and in poor condition. Owner is working with contractors to have the valves, operators and valve house replaced. Currently there are proposals to do the work with water in the reservoir and to drain the reservoir by different contractors.
- The intake pipes upstream of the valves need to be inspected and as built conditions documented if they differ from the 1928 C-224H plans.
- Ice builds up on the valve stems in the winter. Owner keeps a heater on-site to thaw out the valve stems if needed.

CONDITIONS OBSERVED: ☐ Good ☒ Acceptable ☐ Poor

SPILLWAY

PROBLEMS NOTED ☐ (50) NONE ☐ (51) NO EMERGENCY SPILLWAY FOUND ☐ (52) EROSION WITH BACKCUTTING ☐ (53) CRACK - WITH DISPLACEMENT

☐ (54) APPEARS TO BE STRUCTURALLY INADEQUATE ☐ (55) APPEARS TOO SMALL ☐ (56) INADEQUATE FREEBOARD ☐ (57) FLOW OBSTRUCTED

☐ (58) CONCRETE DETERIORATED / UNDERMINED ☑ (59) OTHER

- we surveyed a cross-section approximately at the spillway control section and found it to agree closely with the 1988 C-1690 as-built plans: approx 11.4 ft freeboard (design freeboard was ~10.9 ft per C-1690), spillway top width ~90.6 ft and bottom with ~57-ft. The bottom width is about 4-ft narrower than shown on the C-1690 plans and may be because of talus material that has fallen from the left rock slope. Talus material should probably be cleared from the left side, depending on the results of the Spillway Hydrology study and future plans for enlargement.
- Based on the C-1690 sections we computed a spillway capacity of ~7,000 cfs at 11-ft of head (0.4 feet residual freeboard). However, during the inspection we shot the low point of the downstream dike along the right side of the spillway at El. 7990.74-ft. According to our hydraulic model the dike may overtop at ~6500 cfs. Depending on the result of the Spillway Hydrology study and future plans for spillway enlargement the dike may need to be raised ~0.5 ft to prevent overtopping. The dike should be monitored during spillway events.
- We surveyed a cross-section through the spillway return channel at the downstream toe of the dam. Currently the channel is overgrown with willows -- using a roughness of 0.20 for thick willows and slope of 7.5% (from USGS topo) the return channel capacity is ~1900 cfs before overtopping the stone wall at the toe of the dam. Assuming the willows are cleared and using roughness of 0.035 the capacity would be ~4000 cfs. Willows should be cleared from return channel in the short term. Long term the return channel needs to be designed to convey the inflow design flood.

CONDITIONS OBSERVED: ☐ Good ☒ Acceptable ☐ Poor

ENGINEER'S INSPECTION REPORT
DAM NAME: MOUNT PISGAH

DATE: 6/28/2011
DAM I.D.: 120129

MONITORING

EXISTING INSTRUMENTATION FOUND ☐ (110) NONE ☑ (111) GAGE ROD ☐ (112) PIEZOMETERS ☑ (113) SEEPAGE WEIRS / FLUMES
☐ (114) SURVEY MONUMENTS ☐ (115) OTHER

MONITORING OF INSTRUMENTATION ☐ (116) NO ☑ (117) YES PERIODIC INSPECTIONS BY: ☑ (118) OWNER ☐ (119) ENGINEER

- Strongly recommend that the owner/caretaker perform routine visual inspections and fill out a report. I have enclosed a blank report for you to copy. Colorado's Dam Safety Manual recommends monthly visual inspections when the reservoir level is above one-half full.
- The weir at the old outlets is bowed and needs to be reset. Need to clear vegetation from the weir pool and set a staff gage. Seepage should be monitored monthly for flow rate and turbidity. Reservoir gage height needs to be recorded as well.

CONDITIONS OBSERVED: ☐ Good ☒ Acceptable ☐ Poor

MAINTENANCE AND REPAIRS

PROBLEMS NOTED ☐ (60 NONE ☐ (61) ACCESS ROAD NEEDS MAINTENANCE ☐ (62) CATTLE DAMAGE
☑ (63) BRUSH ON UPSTREAM SLOPE, CREST, DOWNSTREAM SLOPE, TOE ☐ (64) TREES ON UPSTREAM SLOPE, CREST, DOWNSTREAM SLOPE, TOE
☐ (65) RODENT ACTIVITY ON UPSTREAM SLOPE, CREST, DOWNSTREAM SLOPE, TOE ☐ (66) DETERIORATED CONCRETE - FACING, OUTLET SPILLWAY
☐ (67) GATE AND OPERATING MECHANISM NEED MAINTENANCE ☑ (68) OTHER

- Clear willows/brush from spillway return channel along the downtream toe of dam in order to maximize channel flow capacity.
- Control vegetation on upstream slope of dam as needed.
- Control burrowing rodents on downstream slope as needed.
- Perform monthly routine inspections and read seepage weir. Reset seepage weir & install staff gage. Repair leak in diversion pipe so seepage can be monitored better.
- Clear brush from both right and left groins.

CONDITIONS OBSERVED: ☐ Good ☒ Acceptable ☐ Poor

Go to next page for Overall Conditions and Items Requiring Actions

ENGINEER'S INSPECTION REPORT
DAM NAME: MOUNT PISGAH

DATE. 6/28/2011
DAM I.D.: 120129

OVERALL CONDITIONS

Overall the dam appears to be performing well. Main issues are the valves, the spillway size and the old outlet conduits.
1) Valves: Owner is working on replacing them possibly this fall.
2) Spillway Size: Owner's engineer performed a spillway hydrology study and we recently returned it with comments. We had concerns about the results from our Extreme Precipitation Analysis Tool program. We will continue to work with your engineer toward approval of a inflow design flood.
3) Old outlet conduits: Short term-- need to monitor seepage closely and monitor for external signs of distress along the old conduit alignment. Long term -- perform internal inspection if possible and plan to properly abandon the conduits (ex. grouting).

Based on this Safety Inspection and recent file review, the overall condition is determined to be:

☐ (71) SATISFACTORY ☑ (72) CONDITIONALLY SATISFACTORY ☐ (73) UNSATISFACTORY

ITEMS REQUIRING ACTION BY OWNER TO IMPROVE THE SAFETY OF THE DAM

The State Engineer, by providing this dam safety inspection report, does not assume responsibility for any unsafe condition of the subject dam. The sole responsibility for the safety of this dam rests with the reservoir owner or operator, who should take every step necessary to prevent damages caused by leakage or overflow of waters from the reservoir or floods resulting from a failure of the dam.

MAINTENANCE - MINOR REPAIR - MONITORING

- ☐ (80) PROVIDE ADDITIONAL RIPRAP:
- ☑ (81) LUBRICATE AND OPERATE OUTLET GATES THROUGH FULL CYCLE **continue to maintain**
- ☑ (82) CLEAR TREES AND/OR BRUSH FROM: **spillway return channel along downtream toe of dam, upstream slope, and from right & left groin.**
- ☑ (83) INITIATE RODENT CONTROL PROGRAM AND PROPERLY BACKFILL EXISTING HOLES: **downstream slope as needed**
- ☐ (84) GRADE CREST TO A UNIFORM ELEVATION WITH DRAINAGE TO THE UPSTREAM SLOPE:
- ☐ (85) PROVIDE SURFACE DRAINAGE FOR:
- ☑ (86) MONITOR: **seepage at old outlets. Reset weir & install staff gage. Fix leak in diversion pipe so seepage can be monitored better.**
- ☑ (87) DEVELOP AND SUBMIT AN EMERGENCY ACTION PLAN: **EAP needs to be updated. The copy in our files is dated 1994.**
- ☑ (88) OTHER **Perform monthly routine monitoring when reservoir is above 1/2 full. I've enclosed a blank inspection form.**
- ☑ (89) OTHER **Monitor dike on right side of spillway and spillway return channel during spillway flows.**

ENGINEERING - EMPLOY AN ENGINEER EXPERIENCED IN DESIGN AND CONSTRUCTION OF DAMS TO: (Plans and Specifications must be approved by State Engineer prior to construction.)

- ☑ (90) PREPARE PLANS AND SPECIFICATIONS FOR REHABILITATION OF THE DAM: **Please provide us with plans and specifications for the valve replacement project.**
- ☐ (91) PREPARE AS -BUILT DRAWINGS OF:
- ☐ (92) PERFORM A GEOTECHNICAL INVESTIGATION TO EVALUATE THE STABILITY OF THE DAM:
- ☑ (93) PERFORM A HYDROLOGIC STUDY TO DETERMINE REQUIRED SPILLWAY SIZE: **Returned with comments to your engineer. We will continue to work with them to approve an inflow design flood.**
- ☑ (94) PREPARE PLANS AND SPECIFICATIONS FOR AN ADEQUATE SPILLWAY: **if the hydrology report shows it is needed.**
- ☐ (95) SET UP A MONITORING SYSTEM INCLUDING WORK SHEETS, REDUCED DATA AND GRAPHED RESULTS:
- ☑ (96) PERFORM AN INTERNAL INSPECTION OF THE OUTLET: **When gates are closed. Also need to inspect intake conduits upstream of gate valves & document as-built conditions if different from the old construction drawings (C-244H)**
- ☐ (97) OTHER:
- ☐ (98) OTHER:
- ☐ (99) OTHER:

SAFE STORAGE LEVEL: RECOMMENDED AS A RESULT OF THIS INSPECTION

- ☐ (101) FULL STORAGE
- ☑ (102) CONDITIONAL FULL STORAGE
- ☐ (103) RECOMMENDED RESTRICTION → { ___ FT. BELOW DAM CREST; ___ FT. BELOW SPILLWAY CREST; ___ FT. GAGE HEIGHT
- ☐ (104) CONTINUE EXISTING RESTRICTION → NO STORAGE-MAINTAIN OUTLET FULLY OPEN

REASON FOR RESTRICTION

- perform requried maintenance. Continue to make progress on valves, spillway hydrology, and monitoring old outlet conduits.

ACTIONS REQUIRED FOR CONDITIONAL FULL STORAGE ~~OR CONTINUED STORAGE AT THIS RESTRICTED LEVEL~~

Engineer's Signature: [signature] 7/8/11 — INSPECTED BY

Owner's Signature: [signature] — OWNER/OWNER'S REPRESENTATIVE — DATE: 7/14/11

GUIDELINES FOR DETERMINING CONDITIONS

CONDITIONS OBSERVED - APPLIES TO UPSTREAM SLOPE, CREST, DOWNSTREAM SLOPE, OUTLET, SPILLWAY

GOOD
In general, this part of the structure has a near new appearance, and conditions observed in this area do not appear to threaten the safety of the dam.

ACCEPTABLE
Although general cross-section is maintained, surfaces may be irregular, eroded, rutted, spalled, or otherwise not in new condition. Conditions in this area do not currently appear to threaten the safety of the dam.

POOR
Conditions observed in this area appear to threaten the safety of the dam.

CONDITIONS OBSERVED - APPLIES TO SEEPAGE

GOOD
No evidence of uncontrolled seepage. No unexplained increase in flows from designed drains. All seepage is clear. Seepage conditions do not appear to threaten the safety of the dam.

ACCEPTABLE
Some seepage exists at areas other than the drain outfalls, or other designed drains. No unexplained increase in seepage. All seepage is clear. Seepage conditions observed do not currently appear to threaten the safety of the dam.

POOR
Seepage conditions observed appear to threaten the safety of the dam. Examples:
1) Designed drain or seepage flows have increased without increase in reservoir level.
2) Drain or seepage flows contain sediment, i.e., muddy water or particles in jar samples.
3) Widespread seepage, concentrated seepage, or ponding appears to threaten the safety of the dam.

CONDITIONS OBSERVED - APPLIES TO MONITORING

GOOD
Monitoring includes movement surveys and leakage measurements for all dams, and piezometer readings for High hazard dams. Instrumentation is in reliable, working condition. A plan for monitoring the instrumentation and analyzing results by the owner's engineer is in effect. Periodic inspections by owner's engineer.

ACCEPTABLE
Monitoring includes movement surveys and leakage measurements for High and Significant hazard dams; leakage measurements for Low hazard dams. Instrumentation is in serviceable condition. A plan for monitoring instrumentation is in effect by owner. Periodic inspections by owner or representative. OR, NO MONITORING REQUIRED.

POOR
All instrumentation and monitoring described under "ACCEPTABLE" here for each class of dam, are not provided, or required periodic readings are not being made, or unexplained changes in readings are not reacted to by the owner.

CONDITIONS OBSERVED - APPLIES TO MAINTENANCE AND REPAIR

GOOD
Dam appears to receive effective on-going maintenance and repair, and only a few minor items may need to be addressed.

ACCEPTABLE
Dam appears to receive maintenance, but some maintenance items need to be addressed. No major repairs are requirecl

POOR
Dam does not appear to receive adequate maintenance. One or more items needing maintenance or repair has begun to threaten the safety of the dam.

OVERALL CONDITIONS

SATISFACTORY
The safety inspection indicates no conditions that appear to threaten the safety of the dam, and the dam is expected to perform satisfactorily under all design loading conditions. Most of the required monitoring is being performed.

CONDITIONALLY SATISFACTORY
The safety inspection indicates symptoms of structural distress (seepage, evidence of minor displacements, etc.), which, if conditions worsen, could lead to the failure of the dam. Essential monitoring, inspection, and maintenance must be performed as a requirement for continued full storage in the reservoir.

UNSATISFACTORY
The safety inspection indicates definite signs of structural distress (excessive seepage, cracks, slides, sinkholes, severe deterioration, etc.), which could lead to the failure of the dam if the reservoir is used to full capacity. The dam is judged unsafe for full storage of water.

SAFE STORAGE LEVEL

FULL STORAGE
Dam may be used to full capacity with no conditions attached.

CONDITIONAL FULL STORAGE
Dam may be used to full storage if certain monitoring, maintenance, or operational conditions are met.

RESTRICTION
Dam may not be used to full capacity, but must be operated at some reduced level in the interest of public safety.

HAZARD CLASSIFICATION OF DAMS

High hazard
Loss of human life is expected in the event of failure of the dam, while the reservoir is at the high water line.

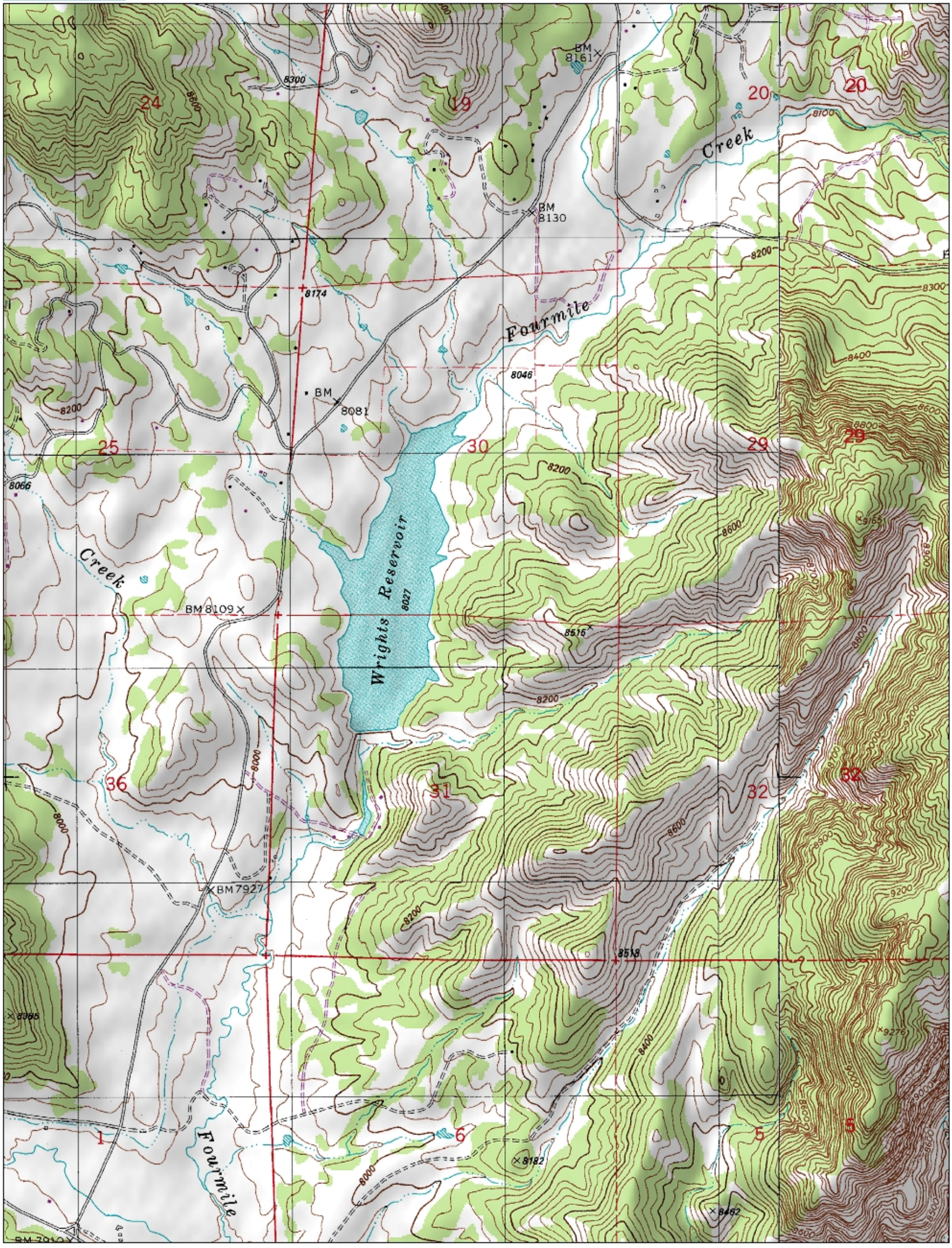
Significant hazard
Significant damage to improved property is expected in the event of failure of the dam while the reservoir is at the high water line, but no loss of human life is expected.

Low hazard
Loss of human life is not expected, and damage to improved property is expected to be small, in the event of failure of the dam while the reservoir is at high water fine.

NPH hazard - No loss of life or damage to improved property, or loss of downstream resource is expected in the event of failure of the dam while the reservoir is at the high water line.

DeLORME

XMap® 5.0 GIS Editor



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MN (8.9° E)

0 600 1200 1800 2400 3000 3600 ft

Data Zoom 13-1

Mt. PISGAH RESERVOIR
(aka Wright's Reservoir)
WATER CAPACITY SURVEY
SECTIONS 30 AND 31, TOWNSHIP 14 SOUTH, RANGE 70 WEST, 6th P.M.
COUNTY OF TELLER, STATE OF COLORADO

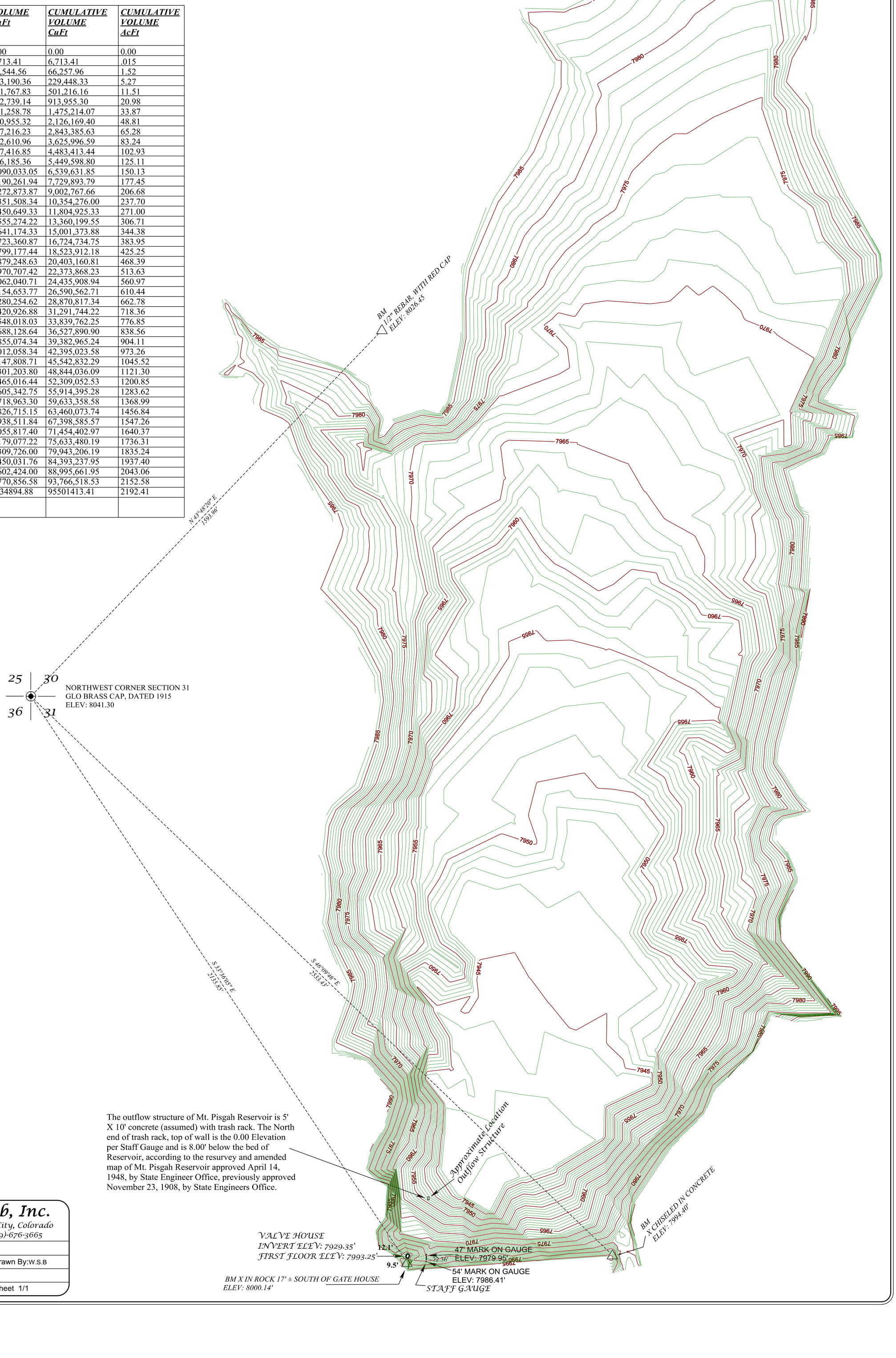
150' 0 150' 300'

SCALE 1" = 150'
U.S. SURVEY FEET

ELEVATIONS SHOWN HEREON OBTAINED BY GPS OBSERVATION ON OCTOBER 24, 2008

Project name	2008-187		
Coordinate Units	US survey feet		
Distance Units	US survey feet		
Height Units	US survey feet		
Date printed	11/1/2008 11:22:27 AM		
Coordinate System	Not selected	Zone	Not selected
Datum WGS 1984		Geoid model	Not selected

ELEVATION	SURFACE AREA SqFt	VOLUME CuFt	CUMULATIVE VOLUME CuFt	CUMULATIVE VOLUME AcFt
7941.13	0.00	0.00	0.00	0.00
7942	15433.12	6,713.41	6,713.41	.015
7943	103655.99	59,544.56	66,257.96	1.52
7944	222724.73	163,190.36	229,448.33	5.27
7945	320810.94	271,767.83	501,216.16	11.51
7946	504667.34	412,739.14	913,955.30	20.98
7947	617850.21	561,258.78	1,475,214.07	33.87
7948	684060.43	650,955.32	2,126,169.40	48.81
7949	750372.03	717,216.23	2,843,385.63	65.28
7950	814849.88	782,610.96	3,625,996.59	83.24
7951	899983.82	857,416.85	4,483,413.44	102.93
7952	1032386.90	966,185.36	5,449,598.80	125.11
7953	1147679.19	1,090,033.05	6,539,631.85	150.13
7954	1232844.68	1,190,261.94	7,729,893.79	177.45
7955	1312903.06	1,272,873.87	9,002,767.66	206.68
7956	1390113.61	1,351,508.34	10,354,276.00	237.70
7957	1511185.05	1,450,649.33	11,804,925.33	271.00
7958	1599363.39	1,555,274.22	13,360,199.55	306.71
7959	1682985.27	1,641,174.33	15,001,373.88	344.38
7960	1763736.47	1,723,360.87	16,724,734.75	383.95
7961	1834618.40	1,799,177.44	18,523,912.18	425.25
7962	1923878.87	1,879,248.63	20,403,160.81	468.39
7963	2017535.96	1,970,707.42	22,373,868.23	513.63
7964	2106545.46	2,062,040.71	24,435,908.94	560.97
7965	2202762.08	2,154,653.77	26,590,562.71	610.44
7966	2357747.17	2,280,254.62	28,870,817.34	662.78
7967	2484106.60	2,420,926.88	31,291,744.22	718.36
7968	2611929.47	2,548,018.03	33,839,762.25	776.85
7969	2764327.82	2,688,128.64	36,527,890.90	838.56
7970	2945820.86	2,855,074.34	39,382,965.24	904.11
7971	3078295.83	3,012,058.34	42,395,023.58	973.26
7972	3217321.60	3,147,808.71	45,542,832.29	1045.52
7973	3385086.00	3,301,203.80	48,844,036.09	1121.30
7974	3544946.89	3,465,016.44	52,309,052.53	1200.85
7975	3665738.62	3,605,342.75	55,914,395.28	1283.62
7976	3772187.99	3,718,963.30	59,633,358.58	1368.99
7977	3881242.31	3,826,715.15	63,460,073.74	1456.84
7978	3995781.36	3,938,511.84	67,398,585.57	1547.26
7979	4115853.43	4,055,817.40	71,454,402.97	1640.37
7980	4242301.01	4,179,077.22	75,633,480.19	1736.31
7981	4377151.00	4,309,726.00	79,943,206.19	1835.24
7982	4522912.52	4,450,031.76	84,393,237.95	1937.40
7983	4681935.48	4,602,424.00	88,995,661.95	2043.06
7984	4859777.68	4,770,856.58	93,766,518.53	2152.58
7984.35	5053907.36	1734894.88	95501413.41	2192.41
43.22 TOTAL				



Wachob and Wachob, Inc.
Professional Land Surveyors, Colorado City, Colorado
P.O. Box 19376, Zip 81019 Phone (719)-676-3665

Job Name: 2008-187.TRV		
Scale: 1" = 150'		Drawn By:W.S.B
Date: = 11-11-2008		
Job No. 2008-187		Sheet 1/1

Traverse PC

Lower Arkansas Valley WATER CONSERVANCY DISTRICT

Serving Bent, Crowley, Otero, Prowers and Pueblo counties

February 27, 2012

Mr. Todd Doherty
Colorado Water Conservation Board
1580 Logan Street, Suite 600
Denver, CO 80203

RE: Letter of Support for Mount Pisgah Dam/Wrights Reservoir Outlet Works Rehabilitation Project

Dear Mr. Doherty,

The Lower Arkansas Valley Water Conservancy District (LAVWCD) enthusiastically supports the CWCB grant application for the repairs to the Mount Pisgah Dam, a project that will serve both consumptive and non-consumptive purposes, and which will benefit multiple water users.

Existing storage capacity is in jeopardy of being restricted by the State Engineer at this time. This project will ensure that the existing storage capacity will be maintained, for recreation, irrigated agriculture, residential and municipal uses.

Please contact me if you have any questions.

Sincerely,

Jay Winner
Executive Director