Feasibility of the
Fruitland Irrigation Company
Tunnel and Canal Renovation Project

Sponsored by the

Fruitland Irrigation Company

in conjunction with the

Colorado Water Conservation Board

May 2017

FEASIBILITY STUDY APPROVAL
Pursuant to Colorado Revised Statutes 37-60-121 &122, and in accordance with policies adopted by the Board, the CWCB staff has determined this Feasibility Study meets all applicable requirements for approval.

Signed 9/8/2017 Date

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Fruitland Irrigation Company

Danny Todd, Board President
34918 Fruitland Mesa Rd, Crawford, CO 81415
970-921-7051

Ron Klaseen, Board Member
2750 7750 Rd, Crawford, CO 81415
970-921-6657

Accountant for the Fruitland Irrigation Company

Randy Fisher, CPA
North Fork Accounting
314 Bridge St., Hotchkiss, CO 81419
970-872-3664

Engineering and Technical Support

Craig Ullmann, PE
Applegate Group, Inc.
118 W. 6th Street, Suite 100
Glenwood Springs, CO 81601
970-631-3675

Acknowledgement of those who assisted in the preparation of this report:

Beth Karberg
Salinity Program Field Coordinator
Colorado Department of Agriculture
690 Industrial Blvd, Delta, CO 81416
970-399-8185

Jakki Taylor
North Fork Accounting
314 W Bridge St, Hotchkiss, CO 81419
970-872-3664

Feasibility Study
Fruitland Irrigation Company
Tunnel & Canal Renovation Project

Introduction (Need for the Project)

The Fruitland Irrigation Company operates and maintains the Fruitland Highline Canal, 17.7 miles of earthen ditch, the Gould Canal 22 miles of earthen ditch including 0.8 miles through two rock tunnels, and the Gould (aka Fruitland, aka Onion Valley) Reservoir with 10,168 acre-feet of decreed storage. The two tunnels in Gould Canal are over 100 years old, and have eroded to the point that their structural integrity is threatened. Since all water released from the reservoir passes through these tunnels, a collapse would eliminate the ability to deliver water after the junior direct diversion right for Fruitland Canal is out of priority, typically in mid-June. A video inspection of the tunnels completed in 2009 is on a disc submitted with the appendices, with representative images included as figures in this report. A Water Management Plan completed for the Fruitland Irrigation System in 2002 estimated canal seepage losses to be 12.5 cfs or 1856 acre-feet annually. Installing pipe to stabilize the tunnels, and concrete liners to upgrade the existing earthen canals will eliminate much of this transit loss, and potentially extend the irrigation season by 15 days. The irrigated area served by this system is relatively water short, so any increase in water deliveries is likely to directly increase production yields. These irrigation delivery canals are also within the Colorado River salinity control area. Eliminating seepage from these earthen canals will reduce salinity and selenium contributions to the Lower Gunnison and Colorado River systems, providing benefits to both downstream users and improving critical aquatic habitat for four endangered fish species.

Project Sponsor

The Fruitland Irrigation Company (FIC) is a mutual ditch company and a non-profit corporation registered in the State of Colorado, established in 1901. Originally established by the Gould brothers as the Fruitland Land, Water and Livestock Company, the company acquired its current name when ownership transferred to the water users of Fruitland Mesa in 1937.

There are currently 130 shareholders for the 200,000 shares of FIC stock. The Fruitland Irrigation Company has the power to set annual assessments to be paid by the shareholders, the power to cut off water deliveries to shareholders that fail to pay their assessments, and the power to offer stock for sale to pay back assessments. At their 2017 Annual Meeting, the shareholders agreed to increase their annual assessments to finance these proposed improvements. The Fruitland Irrigation Company articles of incorporation and by-laws are included in Appendix A.

Project Service Area and Facilities

The Fruitland Irrigation Company provides irrigation water to a 5900 acre service area in Delta and Montrose Counties, based on data collected by the USBR salinity program 2008 ditch mapping effort. The diversion for the Fruitland Canal is located on Crystal Creek, approximately 13 miles south of the Town of Crawford. Irrigated acreage within the service area is primarily used for cattle ranching and hay production, with some grain production as well. A map of the service area and photos of the existing tunnels follow in Figures 1 and 2. It is worth noting that approximately 50% of the acreage served is irrigated by sprinklers, with an estimated 77% system-wide efficiency. Overall, cultivated land in Delta County is 95% furrow and flood irrigated, with a typical irrigation efficiency of 50%.

Hydrology and Water Rights

The source of water for the FIC is direct flow water rights out of Crystal Creek, a tributary of the Gunnison River. The water rights diverted at the Fruitland Highline headgate consist of 7 rights with dates of appropriation ranging from 1901 to 1914, adjudicated from 1914 to 1954, and totaling 537 cfs. Records of the State Engineer's Office indicate that total average annual diversions are 10,103 acre-feet, based on record years 1970 through 2015, and that the maximum diversion rate was 350 cfs for record year 1973. A summary of water rights and the State Engineer's diversion records are found in Appendix B.

During early season high water flows, the Fruitland Highline diverts water from Crystal Creek to fill Gould Reservoir, and to provide irrigation water delivered by the Gould Canal. After mid-June, these direct diversion rights are typically out of priority, and irrigation water is then released from Gould Reservoir through mid-August in most years.

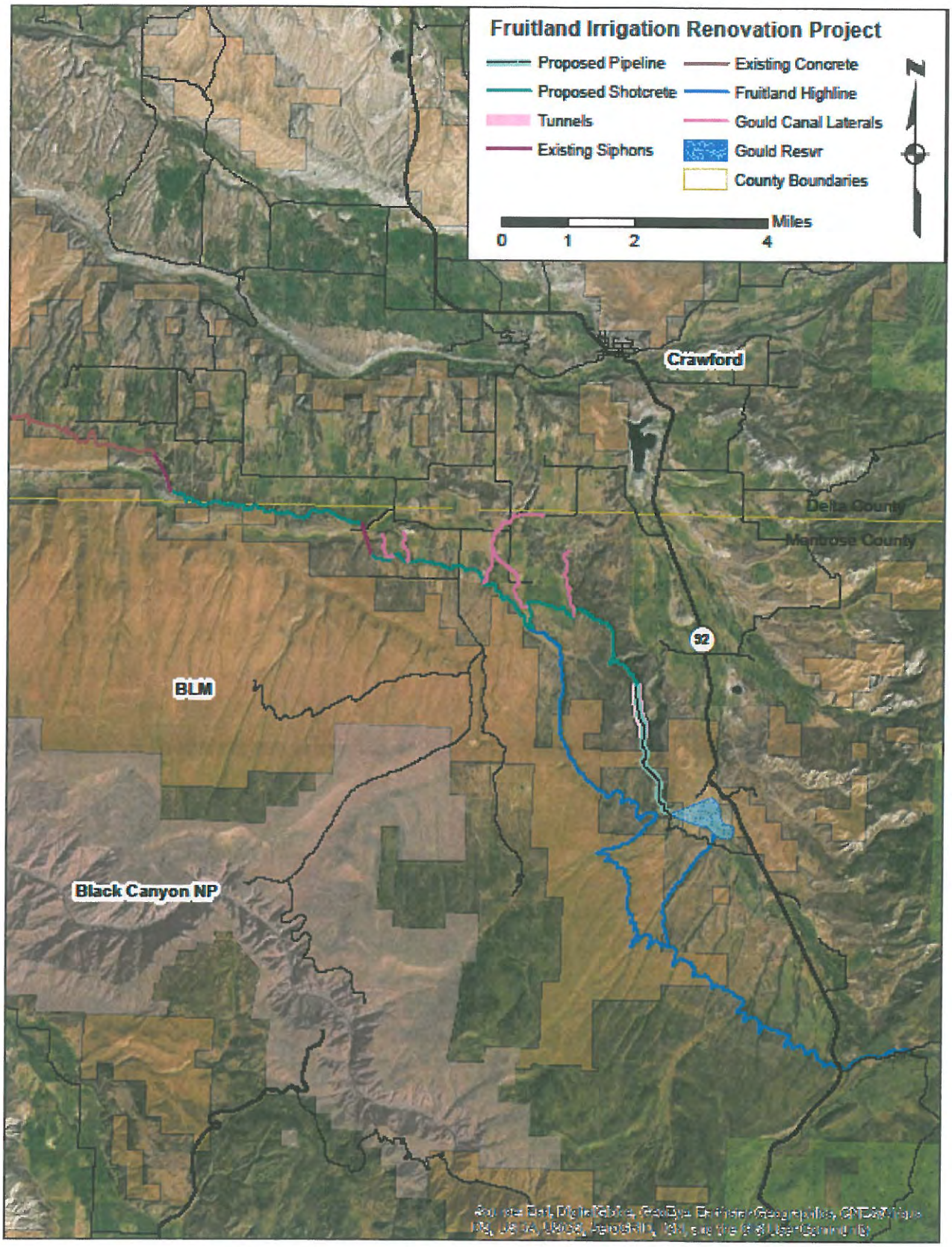

Figure 1. Fruitland Irrigation Company Vicinity Map

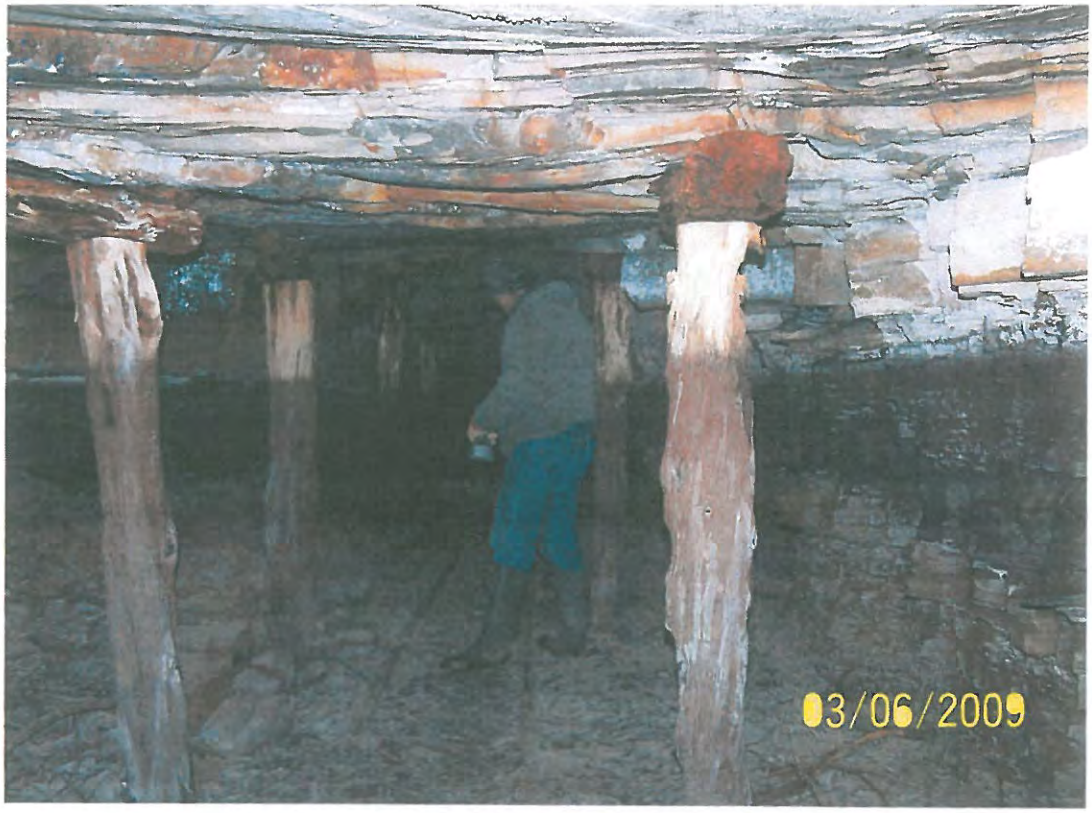

Figure 2: Gould Tunnel Photos
Above: Tunnel segment with significant side erosion, Below: Ceiling erosion

Project Description and Alternatives

The purpose of this project is to stabilize and renovate the tunnels, and improve the Gould Canal to assure the continued ability to deliver irrigation water to shareholders while minimizing seepage losses and salinity contributions to the Colorado River drainage.

Five alternatives were considered:

1. The no-action alternative
2. Pressure pipe
3. Gravity pipe
4. Shotcrete and geomembrane liner
5. Rock-filled geocell and geomembrane liner.

Alternative No. 1 no action, was considered unacceptable since the tunnels will collapse without significant rehabilitation and prevent the Fruitland Irrigation Company from delivering water to its shareholders from Gould Reservoir. No action will also continue annual contributions of 6053 tons of salt to the Colorado River system, and if operational, the system will continue to lose an estimated 22% of diversions to seepage.

Alternative No. 2 pressurized pipeline, was ruled out because pressure is available from on-farm pipelines, with little more to be gained by pressurizing the primary contour delivery ditch, at a significantly increased cost. Pressurized piping of the entire canal would cost $5,000,000 more than the selected alternative. Financing this increased construction cost is not desirable or feasible.

Alternative No. 3 gravity pipeline, was chosen for the Gould Canal from the reservoir outlet through the two tunnels. The open canal in the canyon above the tunnels requires maintenance several times each season to remove rock fall, so pipe was strongly preferred for this section. Gravity pipe is a lower cost option than the alternative pressurized pipeline, and is an acceptable alternative for rehabilitation of the tunnels.

Alternative No. 4 shotcrete liner, was selected as the lower cost option for improving the open canals below the tunnels, and the more feasible lining option for installation in the relatively remote location.

Alternative No. 5 rock-filled geo-cell liner, was ruled out due to difficulty and expense of importing the required rock material, and the inability to protect the liner from damage inflicted by regular elk crossings of the canal.

The analysis of these alternatives and engineer's estimate of probable cost was developed by Craig Ullmann, PE, Applegate Group, Inc. The report of this study is included in Appendix C.

The proposed project plans to pipe the Gould Canal from the reservoir outlet, through the two tunnels, installing a total of 2.1 miles of HDPE pipe. The pipeline in the tunnels will be stabilized and protected with cellular concrete. Another 10.3 miles of ditch will be improved with PVC-geo-tech liner covered with shotcrete.

Table 1. Cost Estimate for FIC – Tunnel Renovation & Canal Lining Project

Canal Section	Length		Construction Cost
Gravity Pipe Section 1	6744	LF	$ 1,065,147
Upper Tunnel Construction	1643	LF	$ 859,289
Lower Tunnel Construction	2562	LF	$ 1,339,926
Shotcrete Lining Section 2	11225	LF	$ 954,713
Shotcrete Lining Sections 3 & 4	24930	LF	$ 2,765,252
Shotcrete Lining Section 5	18472	LF	$ 1,666,970
Total Construction Costs			$ 8,651,297
Engineering - Canals	5.0%		$ 322,604
Engineering - Tunnels	7.0%		$ 153,945
Construction Observation	5.0%		$ 432,565
Project Management			$ 40,000
NEPA/Cultural Resources	1.5%		$ 129,769
Habitat Mitigation	5.0%		$ 432,565
Total Indirect Costs			$ 1,511,448
Total Project Costs			$ 10,162,746

Implementation Schedule

Fruitland Irrigation Company will submit an application for additional funding to the USBR Colorado River Basinwide Salinity Program FOA in November 2017. State funding to complete the financing for this project will need to be documented in this application. Award of USBR salinity funding is anticipated in January 2018. After notification of award, environmental and cultural resource surveys, and engineering design work can proceed. It is anticipated that contracting will occur in the spring of 2018, with pre-construction planning and permitting completed during the following 12 months. Construction will proceed during the fall of 2019. If delays occur, or a phased construction schedule is required, construction could be completed during the fall of 2020. An estimated project implementation schedule is included in Appendix D.

Permitting

All construction work is anticipated to occur within existing canal easements. NEPA and cultural resource surveys will be completed prior to any construction activity to satisfy federal funding requirements. No other permitting requirements are anticipated.

Institutional Considerations

Entities that are, or may be, involved in the design, construction, and financing of the project include:

- Fruitland Irrigation Company: financing and project management,
- Applegate Group, Inc.: project planning, design, and construction management,
- USBR: financing and construction review,
- Colorado Water Conservation Board (CWCB): financing and construction review
- NRCS: financing through the Regional Conservation Partnership Program.

The Fruitland Irrigation Company will be the lead entity for the financing, design, and construction of the project and will enter into contracts and agreements with the various entities for the services provided by each.

Financial Analysis

Several entities will be involved in financing the estimated total project cost of $10.253 million. The Fruitland Irrigation Company is applying for a loan from the CWCB in the maximum amount of $1,771,400. Two funding scenarios are shown in Table 2. The FIC has submitted a pre-proposal to apply for NRCS-Regional Conservation Partnership Program funding. If this RCPP application is successful, scenario 1 funding plan will be pursued. However, if this RCPP application is not awarded funding, scenario 2 will define the funding plan, with higher state funding requests. This application, therefore, is requesting approval of the higher loan amount required for scenario 2. The Fruitland Irrigation Company will cover any costs that exceed the estimated project cost.

Table 2. Sources of Funding

	Scenario 1: With NRCS-RCPP Funding			Scenario 2: Without NRCS-RCPP Funding		
Funding Source	**Grant**	**Loan**	**Percent**	**Grant**	**Loan**	**Percent**
BOR Basinwide Funding	$ 6,000,000		57%	$ 7,451,349		74%
NRCS-RCPP	$ 3,625,000		34%	-		
CO River District	$ 50,000		0.5%	$ 50,000		0.5%
CWCB Water Project Loan		$ 547,746	5%		$ 1,721,397	16%
Fruitland IC - In-Kind	$ 40,000		0%	$ 40,000		0.4%
WSRF Gunnison Basin Grant	$ 25,000		0.2%	$ 150,000		1.4%
WSRF State Fund Grant	$ 250,000		2%	$ 750,000		7%
Total	$ 9,990,000	$ 547,746	100%	$ 8,441,349	$ 1,721,397	100%
Project Total	**$ 10,537,746**			**$ 10,162,746**		

Total project funding is higher in the "With NRCS-RCPP" scenario to cover the additional program costs of a watershed plan and NRCS-Technical Assistance reimbursements. The Fruitland Irrigation Company is requesting a 40-year loan from the CWCB. The standard agricultural lending rate of 2.05% results in annual payments of $69,828 including a 10% contribution to fund the emergency reserve account. Table 3 summarizes the financial aspects of the project. FIC annual assessments will increase from $0.50 per share to $0.85 per share to

service a loan of $1,721,400. This assessment represents an annual increase of $0.35 per share, or a total cost of $6.91 per acre-foot, based on average annual diversions 10,103 acre-feet.

Table 3. Financial Summary

Project Cost	$	10,162,746
Loan Amount	$	1,721,400
CWCB Loan Payment Amount, including 10% loan reserve	$	69,828
Number of Shareholders		130
Number of Shares of Stock		200,000
Current Assessment per Share	$	0.50
Future Assessment per Share	$	0.85
Annual Project Cost per acre-foot	$	6.91
Average annual diversions: acre-feet		10,103

Since all other project funding is in the form of grants, the FIC would have no other debt service on this project. Operation and maintenance costs are expected to decrease with the canal improvements, and are accommodated by the Company's existing budget.

Credit worthiness: Fruitland Irrigation Company has a current CWCB loan, with a November 2016 balance of $91,128.85. Payment of debt service on this existing loan is covered by the FIC's existing budget. This loan was obtained to make repairs to the dam and outlet works on Gould Reservoir in 1989-1990. Table 4 shows the Financial Ratios for the Fruitland Irrigation Company and indicates average to strong ability to repay with the project in place.

Table 4. Financial Ratios

Financial Ratio	Without Project	With Project
Operating Ratio (revenue/expense)	128%	115%
Debt Service Coverage Ratio (revenues-expenses)/debt service	229%	125%
Cash Reserves to Current Expense	142%	76%
Annual Cost per AF delivered	$ 9.90	$ 16.81

Alternative financing considerations: The Fruitland Irrigation Company has investigated alternative financing sources, and is pursuing primary financing of this project through the Bureau of Reclamation's Colorado River Basinwide Salinity Control Program and NRCS Regional Conservation Partnership Program.

Collateral: The Fruitland Irrigation Company can pledge assessment income and the project itself as security for the CWCB loan.

Economic Analysis

The economic benefit of this project is estimated to be $2,577,000 per year, attributed to the benefits of salinity reduction by eliminating deep percolation from the ditch, increased hay and grain production from an extended irrigation season ($7505=5000 acres*1 ton/acre*$150/ton), and reduced ditch maintenance costs ($5K). A benefit to Colorado River users for salinity control of $300/ton was used for this analysis. Considering total project costs and a project life of 50 years, the project benefit to cost ratio is 13:1. Considering only the State funds requested from WSRF grants and a CWCB Water Project Loan, the benefit to state-cost ratio is 49:1.

Social and Physical Impacts

The project's *social impacts*, include the ability to provide reliable delivery of irrigation water for the foreseeable future and increase the sustainability of agriculture in the service area. The project will have minor negative *physical impacts* during construction. Positive *physical impacts* include an additional 2700 AF of irrigation water available for irrigation, and improved water quality in the Lower Gunnison and Colorado River system from reduced deep percolation contributions of salinity (6053 tons/year) and selenium (484 lbs/yr). Wildlife habitat and other environmental impacts will be mitigated as required by the USBR-Basinwide program.

Water Plan Goals

Implementation of this project directly meets the following five (of eight) goals of the Gunnison Basin Implementation Plan:

1. Protects existing water uses in the Gunnison Basin;
2. Discourages the conversion of productive agricultural land to other uses;
3. Improves agricultural water supplies to reduce shortages;
4. Improves water quality;
5. Restores, maintains and modernizes critical water infrastructure.

This project also supports the following water values identified in Chapter 10 of the Colorado Water Plan:

1. Supports a vibrant agricultural economy;
2. Improves the efficiency of water delivery infrastructure;

3. Promotes a strong & healthy environment by improving water quality in the Colorado River, including aquatic habitat for the four endangered fish species.

The FIC Tunnel and Canal Rehabilitation Project also directly supports the goals of the Water Plan's Agricultural Critical Actions to:

- ❖ Maintain agricultural viability,
- ❖ Support agricultural water conservation and efficiency.

Conclusions

1. The Fruitland Irrigation Company is an incorporated entity in the State of Colorado with the ability to enter into a contract with the CWCB for the purpose of obtaining a Construction Fund loan.

2. Rights-of Way and easements are adequate for the construction of this project.

3. The project would provide for the continued delivery of irrigation water to 130 shareholders, serving over 5000 irrigated acres.

4. Water quality benefits include a reduction of salinity contributions to the Colorado River of 6053 tons per year and selenium reduction of 484 pounds per year.

5. The project leverages state funds to enable access to a significant investment of federal funds. The total estimated cost of the project is $10.3 million, which will be primarily financed by the USBR Colorado River Basinwide Salinity Control Program, with supportive funding from the Gunnison Basin and State WSRF grants, and the remaining $1.77 million financed by a CWCB Construction Loan.

6. The project is technically and financially feasible.

Appendix A

Fruitland Irrigation Company

Articles of Incorporation

And

By-Laws

KNOW ALL MEN BY THESE PRESENTS, That we, George B. Gould, Ernest S. Gould & Edward G. Gibson

residents of the State of Colorado, have associated ourselves together as a Corporation under name and style of The Fruitland, Land, Water and Live stock Company , for the purpose of becoming a body corporate and politic under and by virtue of the laws of the State of Colorado, and in accordance with the provisions of the laws of said State we do hereby make , execute and acknowledge six certificates in writing of our intentions so to become a body corporate under and by virtue of said laws.

I

The corporate name and style of said corporation shall be The Fruitland, Land, Water and Livestock Company.

II

The objects for which the said Company is created, are to acquire by all lawful means , and hold and lawfully dispose of the same , as th the said Company may deem advisable ,

First——Lands and interests and rights therein and thereto , with authority and power to till or otherwise use such land.

Second—— Water and interests and rights therein and thereto for the exclusive use and Benefit of its stockholders

Third———To acquire own, construct, maintain and operate reservoir reservoir sites, canals and ditches, flumes roads and fences , and to acquire rights privileges franchises and rights of way therefor and to acquire all machinery , tools appliances , teams or other things deemed necessary or incidental in, or to, the construction maintenance or operation of said reservoirs, ditches flumes, and roads and fences for the preservation or use of water , and for working farming or otherwise lawfully using said lands, and to acquire, raise , breed, own and hold , or dispose of , as said Company may deem advisable, Live stock of any and all kinds

Taking water from Crystal Creek, at a point about 80 rods down stream from where the section line between sections 34 and 35 Tp50 N.R.6 W. New Mexico P.M.crosses said Creek, from thence in Westerly direction to near the sectionnof Sec. 34 Tp 50 N.R.6 W. from which point it is intended to have the Canal fork and the water flow in two directions -- The lower Canal to be known as the Fruitland Canal, to continue from thence in a Westerly direction to a point near the N.W.corner of the N.E.1/4 of Sec.33, thence in a Northerly direction to near or rather to the North line of said Sec.33, thence in North westerly direction through Sec.28 and the South west 1/4 of Sec.21 and N.E.1/4 of Sec.20 and the S.W.1/4 of Sec.17,thence in a North westerly direction through and across Sec.18 - The above mentioned sections being situated in Tp 50N.R.6W. New Mexico P.M., thence in a Northerly direction through and across N.E.1/4 of the N.E.1/4 of Sec.13, thence Northerly through and across Sec.12 and to a point near the S.W. corner of the N.E. corner of Sec.1 Tp 50 N.R.7 W., thence in a North westerly direction to a point near the N.E. corner of She.N.W.1/4 of said Sec. No.1, thence in a North westerly direction through the S.W.1/4 of Sec.36, thence in a westerly direction through Sec.35, thence in a North westerly direction through and across the N.E. 1/4 of Sec.34 and through and across Sec.27 and the N.E.1/4 of the N.E.1/4 Sec.28 and on to a point in Sec.21 near its S.E.corner,thence in a Westerly direction to a point on the West line of said Sec.21, about 1,000 ft.North of the S.W.corner of Said Sec 21, thence Westerly through Sections 20 & 19 Tp51 N.R.7W. New MexicoP P.M., thence in a Westerly direction through Sections 24,23 and 22 of Tp 51 N.R.8 W. New MexicoP.M., thence on to its terminus to a point near the centre of Sec.21 of the last mentioned Townahip.

The other and upper Canal to be known as the Fruitland high-land Canal to begin at the aforesaid point near the Sec. 34 Tp 50 N.R.6 W. and run thence in a S.W. direction through Sections 34 & 33 to the S.W. corner of 33, thence Westerly near the S.Tp line of Tp 50 N.R. 6 W. New Mexico P.M. to near the S.W. corner of Sec.32 - thence in a North westerly direction through Sec.31 Tp 50 N.R.6 W. New Mexico P.M. thence in a North westerly direction through Sec.31 Tp 50 N.R.6 W. New Mexico P.M., thence in a North westerly direction through Sections 36 &

25 to a point in Sec.23 near the S.E. corner thereof, thence in a N.E. direction through Sec.24, thence in a North westerly direction through Sections 13,11 and 2 in Tp 50 N.R.7 W., thence in North westerly direction through the S.W.1/4 of Sec.35 and the N.E.1/4 of Sec.34 to intersection with the herein before described Fruitland Canal at a point near the S.W. corner of the N.E.1/4 of the N.E.1/4 of said Sec.34 --- And also taking water from Poison Springs Gulch at a point near the S. W.corner of Sec.3 Tp 50 N.R.7 W. New Mexico P.M., running thence in a Northerly direction to intersect with the Fruitland Canal herein before described at a point near the N.W. corner of the N.E.1/4 of Sec.34 Tp 5 51 N.R.7 W.New Mexico P.M. and also at a point near the N.W.corner of Sec.30 Tp 51 N.R.7 W., running thence a distance of 500 feet in a Westerly direction to irregate land near and below the terminus thereof.

It is also proposed to make,build and construct reservoirs at the different points along the line of said Canals for the purpose of conserving,saving and storing up portions of the waters taken from said Crystal Creek and Poison Springs Gulch when not needed for and directly used upon the lands for which said waters have been appropriated --- Said Reservoirs to be located about as follows, One to be known as Fruitland Reservoir No2- to be located at a point about 2200 ft.West of the S.W. corner of Sec.34 Tp 50 N.R.6 W. covering an area of about 10 acres and having a capacity of about 3,500,000 cu.ft. ---Another Reservoir to be known as Fruitland Reservoir No 4 - to be located mostly upon Sec.18 Tp 50 N.R.6 W. containing about 500 acres with a capacity of about 600,000,000 cu.ft., Another one to be known as Fruitland Reservoir No 6 situated on a portion of the S.1/2 of Sec.35 Tp 51 N.R.7 W. having an area of about 50 acres with a capacity of 40,000,000 cu.ft.- And another known as Fruitland Reservoir No 8 - located near the North line of Sec.34 Tp 51 N.R.7 W. about 2000 feet West of the N.E.corner of said Sec.34, covering an area of about 20 acres and having a capacity of about 10,000,000 cu.ft. --- And another one to be known as Fruitland Reservoir No 10- located on the Southern portion of Sections 20 & 21 and a portion of Sec.29 Tp 51 N.R.7 W., New Mexico P.M., covering an area of about 200 acres and having a capacity of about 125,000,000 cu.ft.

The waters to be used for the principal purpose of irrigation with and incidentally for domestic and mechanical purposes.

All Sections above given are in the first described Township, after such Sections are respectively mentioned.

III

The capital stock of our said Company, is Fifty Thousand Dollars to be divided into fifty thousand shares of One Dollar for each share.

IV

Our said Company is to exist for the term of twenty years.

V

The affairs and management of our said Company are to be under the control of a board of seven directors and George B. Gould, Willard D. Gould, Emmet S. Gould, Edward G. Graves, John Gould, James Gould and La Verne Faure are hereby selected to act as said board of directors and to manage the affairs and concerns of said Company for the first year of its existence, and until their successors are duly elected and qualified and enter u pon the discharge of their duties as such.

VI

The operations of our said Company will be carried on in the Coun--ties Delta, Montrose and Gunnison, and the principal place and busi-ness office shall be located in the City of Denver, County of Arapa-hoe, State of Colorado .

VII

Said board of directors shall have power to make such prudential by-laws as they shall deem proper for the management of the affairs of the said Company, according to the statute in such cases made and provided.

IN WITNESS WHEREOF , we have hereunto set our hands and seals this 19th day of August A.D. 1901

George B. Gould

Emmet S. Gould

Edward G. Graves

STATE OF COLORADO :
: S.S.
COUNTY OF :

I Harry L Kock a Notary Public

in and for said county , in the state aforesaid, do hereby certify that George B Gould Emmet S Gould and Edward G Gaar

personal known to me , whose names are subscribed to the within and foregoing certificate of incorporation , appeared before me this day in person and acknowledged that they signed, sealed and delivered the said instrument of writing as their free and voluntary act and for the uses and purposes herein set forth.

I further certify that my commission expires ——

Given under my hand and notarial seal this 19th day of August A.D. 1901

Harry L Kock

SAM L. COCKRELHAM
ASSESSOR, DELTA COUNTY

COUNTY OFFICIALS
E. M. Curtis, R. O. Wilmot, Joe. Hogrefe } Commissioners
C. S. Gibbs, Sheriff
D. S. Doughty, Clerk
J. E. Beckley, Treas.
S. L. Cockrelham, Assessor
Emma G. Myers, Supt. Sch'ls
J. A. Curtis, Surveyor
F. N. Dickerson, Judge
C. H. Burgin, Coroner
George Stephan, Attorney

Delta, Colo, May 4th 1910.

To Whom it may Concern,

This is to Certify that the Fruitland Irrigation Company is not a Corporation that are selling water therefore its are non Assessable and are uot Taxed in Delta County.

Very Truly.

Sam L Cockrelham

County Assessor of Delta County.

Fruitland
Irrigation Co.
Exempts
Assessors Ctf -
May 4 - 1910

Checked

#5895

29038

Articles of Incorporation of The Fruitland Land Water and Live Stock Company.

DOMESTIC

[illegible] in the office of the Secretary of State of the State of Colorado on the 2 day of [illegible] A.D. 190[illegible] at [illegible] o'clock [illegible]

Recorded in Book [illegible] Page [illegible]

[illegible] Secretary of State

[illegible] Deputy

This document has been inspected and properly Entered on the Records of The Flat Tax Department.

O K

Date May 29, 1968

[illegible] Clerk

CERTIFICATE OF FULL PAID CAPITAL STOCK—The Smith-Brooks Printing Company, State Printers, Denver, Colorado.

CERTIFICATE OF FULL PAID CAPITAL STOCK

—OF—

The Fruitland Land Water and Live Stock Company.

STATE OF COLORADO, }
COUNTY OF _____ } SS.

We, the undersigned, the President and a majority of the Directors of The Fruitland Land Water & Live Stock Company, a corporation duly organized and existing under the laws of the State of Colorado, do hereby certify that the total Capital Stock of the said Company, as fixed by its Certificate of Incorporation, is Fifty Thousand Dollars ($50.000), and that all of said stock has been issued and fully paid in. And we further certify that said stock has been issued as follows:

For Property Fifty Thousand Shares $50.000
For Cash $

Total $50000

IN WITNESS WHEREOF, we have hereunto set our hands and seals at Aspen Colorado this 28 day of July A. D. 1902

James Gould
President.

James Gould
Edward G Gray
E T Gould
Geo. B Gould
A Majority of the Directors.

STATE OF COLORADO, }
COUNTY OF Pitkin } SS.

Subscribed and sworn to before me by James Gould Edward G. Gray Ernest T. Gould and Geo B Gould

this 28 day of July A. D. 1902

My commission expires June 3 A. D. 1903

Harry McKoch
Notary Public.

No. 35124

CERTIFICATE OF FULL PAID CAPITAL STOCK

...OF...

The Fruitland Land Water and Live Stock Company.

OXE

DOMESTIC.

Filed in the office of the Secretary of State of the State of Colorado, on the 8 *day of* Aug *A. D. 190*7, *at* 10 *o'clock* A *M.*

Recorded in Book 75 *Page* 411

David A Mills
Secretary of State.

By [illegible]
Deputy.

2.50

CERTIFICATE.

THE FRUITLAND LAND, WATER AND LIVE STOCK COMPANY.

FIRST AMENDMENT TO THE ARTICLES OF INCORPORATION.

It is hereby certified that on Saturday, the 18th day of November, A.D. 1905, at a special meeting of the stockholders of the Fruitland Land, Water and Live Stock Company, held in pursuance of law, the by-laws of said company and a notice of such meeting, stating among other things, that a proposed amendment to the Articles of Incorporation of said company would be presented and acted upon at such meeting and giving the purport of such proposed amendment, which said notice was duly given and published as provided by law, Article III of the Articles of Incorporation of The Fruitland Land, Water and Live Stock Company was amended so as to read as follows to-wit:

ARTICLE III.

"The capital stock of said company shall be two hundred thousand dollars, divided into two hundred thousand shares of the par value of one dollar each."

The said amendment having been adopted by the vote of more than two thirds (2/3) of the capital stock of said company, then subscribed and in good faith outstanding.

Witness the signature of the President and the attestation of the Secretary and the seal of the said Company, at its office in Denver, Colorado, this 21st day of November, A.D. 1905.

President.

STATE OF COLORADO,)
)ss.
City and County of Denver,)

John Gould being first duly sworn deposes and says: That he is the President of the Fruitland Land, Water and Live Stock Company, a corporation created and existing under and by virtue of the laws of the State of Colorado; that he has read the foregoing Certificate and knows the contents thereof, and that the same is true of his own knowledge.

John Gould
President

Subscribed and sworn to before me this 7th day of [illegible]

[illegible]

My Commission Expires March 13, 1907.

41558

CERTIFICATE.

The Fruitland Land, Water and Live Stock Company.

Amendment to Articles of Incorporation.

DOMESTIC

FILED in the office of the Secretary of State, of the State of Colorado, on the 14 day of December A. D. 190 5 at 11 o'clock, A. M.
Recorded in Book 112 Page 128
James Cowie
Secretary of State.
By Timothy O'Connor
Deputy.

35.00

This document has been inspected and [illegible] on the Records of the [illegible] Tax Department.
Date May 29 1958 OK
[illegible] Clerk

CERTIFICATE.

THE FRUITLAND LAND, WATER AND LIVE STOCK COMPANY.

SECOND AND THIRD AMENDMENTS TO THE ARTICLES OF INCORPORATION.

IT IS HEREBY CERTIFIED, that on Thursday the 12th day of September, A.D.1907, at the annual meeting of the stockholders of The Fruitland Land, Water and Live Stock Company, held in pursuance of law, the by-laws of said company and a notice of such meeting, stating, among other things, that two proposed amendments to the articles of incorporation of said company would be presented and acted upon at such meeting and giving the purport of such proposed amendments, which said notice was duly given and published as provided by law, Articles I, and VI of the Articles of Incorporation of said The Fruitland Land, Water and Live Stock Company were amended so as to read as follows, to-wit:

ARTICLE I.

The corporate name of said company shall be THE FRUITLAND IRRIGATION COMPANY.

ARTICLE VI.

The principal business of said company shall be carried on in the counties of Delta, Montrose and Gunnison, and the principal office of said company shall be kept in the Town of Hotchkiss, Delta County, Colorado.

The said amendments having been adopted by the vote of more than two-thirds (2/3) of the capital stock of said company, then subscribed and in good faith outstanding.

WITNESS the signature of the President and the attestation of the Secretary and the seal of the said Company, at its office in Denver, Colorado, this 13th day of October, A.D.1907.

A. J. Hadley
President.

Secretary.

8

TATE OF COLORADO,)
)ss.
ounty of Delta.)

A.J.Hadley, being first duly sworn, deposes and says
at he is the President of THE FRUITLAND LAND, WATER AND LIVE STOCK COM-
ANY, a corporation created and existing under and by virtue of the laws
of Colorado; that he has read the foregoing CERTIFICATE and
ents thereof, and that the same is true of his own knowledge.

My Commission Expires August 22, 1908

Samuel C. Hume
Notary Public

...scribed and sworn to before me this 25th day of October, A.D. 1907.

45895

CERTIFICATE,

THE FRUITLAND LAND, WATER AND LIVE STOCK COMPANY.

Change of name

DOMESTIC

AMENDMENTS

TO

ARTICLES OF INCORPORATION.

[illegible] in the office of the [illegible] of the State of [illegible] day of [illegible] A.D. 190[illegible], at [illegible] o'clock [illegible] recorded in Book 126 Page [illegible]

[illegible signature]

[illegible signature]

30.00

This document has been inspected and properly Entered on the Records of The Flat Tax Department

Date Mar 20 1968 OK

[illegible signature] Clerk

BY LAWS
OF
THE FRUITLAND IRRIGATION COMPANY

ARTICLE I -- Incorporation

The name of this company is THE FRUITLAND IRRIGATION COMPANY, a corporation organized and existing under and by virtue of the laws of the State of Colorado.

ARTICLE II -- Seal

The seal of this corporation shall contain the word "Seal" in the center thereof, with the words "The Fruitland Irrigation Company," in the form of a circle, an impression of which is attached to the margin hereof.

ARTICLE III -- Meetings of Stockholders

Section 1 -- Annual Meeting. The annual meeting of the stockholders shall be held in January of each year,[1] at such time and place in the vicinity of the Town of Crawford, Delta County, Colorado, as shall be designated in the notice of the meeting, for the purpose of electing directors, passing upon reports covering the previous fiscal year, and transacting such other business as may come before the meeting. If the election of directors shall not be held on the day designated herein for any annual meeting or at any adjournment thereof, the Board of Directors shall cause the election to be held at a special meeting of the stockholders as soon thereafter as conveniently may be. Failure to hold the annual meeting at the designated time and place shall not work a forfeiture of the corporation.

Section 2 -- Special Meeting. Special meetings of the stockholders may be called by four (4) directors, or upon a written request signed by ten per centum (10%) of the owners of outstanding stock, and it shall thereupon be the duty of the secretary to cause notice of such meeting to be given as hereinafter provided. Except in emergencies, special meetings may be called by giving three days' notice.

Section 3 -- Notice of Stockholders' Meetings. Public notice of the time and place of holding of stockholders' meetings shall be published once, not less than ten (10), nor more than thirty (30), days previous thereto, in a newspaper published in the County of Delta. Written or printed notice stating, the place, day and hour of the meeting, and in case of a special meeting the purpose or purposes for which a meeting is called, shall also be delivered not less than 30 days before the date of such meeting, either personally or by mailing to each stockholder, and no business shall be transacted at such special meeting except as shall be mentioned in the notice.

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[1] Amended Feb. 2, 2006.

Section 4 -- Quorum. At all meetings of the stockholders a majority of all stock outstanding must be represented in person or by proxy for the purpose of election of directors or the transaction of business. If the majority of stock issued is not represented at any annual or special meeting, such meeting may be adjourned by the stockholders present for a period not to exceed sixty (60) days at any one adjournment.

Section 5 -- Voting. Only stockholders of record, or a person holding a proxy of a stock holder of record shall be entitled to vote at the regular or special meetings of stockholders. At such meeting each stockholder, either in person or by proxy, shall be entitled to one vote for each share of stock held in his name.

Section 6 -- Proxies. A stockholder may vote by a proxy executed in writing. Such proxy must be filed with the secretary before or at the time of meeting; such proxy must designate the particular meeting at which it is to be voted, and no proxy shall be voted at any meeting other than the one so designated, or an adjournment of such meeting. The presence of a stockholder shall revoke a proxy previously executed by him, and such stockholder shall vote his stock with the same effect as though the proxy had not been executed.

Section 7 -- Committee on Credentials. To facilitate the orderly conduct of stockholders' meetings, whether annual or special, the president, or, in his absence the vice-president, shall appoint three (3) stockholders not holding office as directors, as a committee on credentials; the said committee shall register all proxies and persons entitled to vote and shall in a systematic way register and tabulate said votes so the same may be readily cast at such meeting and shall report the result.

The said committee shall be the judges of election, and shall provide blank ballots and a ballot box and shall count and report the result of the vote.

After the closing of the polls, the committee shall make a report in writing of the total number of votes cast, the names of the persons for whom voted, and the number of votes for each. After the meeting, all records of the credentials committee shall be turned over to the secretary to become a permanent record of the corporation.

Section 8 --Order of Business. The order of business at the annual meeting of stockholders and, as far as possible, at all other stockholders' meetings, shall be essentially as follows:

1. Report of credentials committee.

2. Reading of the notice of meeting and proof of publication or mailing thereof, or waiver or waivers of notice of the meeting, as the case may be.

3. Reading of unapproved minutes of previous meetings of the stockholders, and taking necessary action thereon.

4. Presentation and consideration of reports of officers, superintendent, directors and committees.

5. Unfinished business.

6. New business.

7. Election of directors.

8. Adjournment.

Section 9 -- Waiver of Notice. Any stockholder or director may waive in writing any notice of meetings required to be given by these By-Laws.

ARTICLE IV -- Directors

Section 1 -- General Powers. As provided in the articles of incorporation, the business and affairs of the corporation shall be managed by a board of seven (7) directors, which shall exercise all the powers of the corporation except such as are by law or the certificate of incorporation or these by laws conferred upon or reserved to the stockholders.

Section 2 -- Qualification and Tenure. A board of seven (7) directors shall be elected annually at the stockholders' meeting called for such purpose and shall serve until their successors shall have been elected and qualified. Directors shall be stockholders of the corporation and property owners of the area served by the ditches and reservoirs of the company.

Section 3 -- Vacancies. Vacancies occurring in the Board of Directors shall be filled by a majority of the remaining directors, and directors thus elected shall serve until the next annual meeting of the stockholders, or until their successors shall have been elected and qualified.

Section 4 -- Compensation. Directors as such shall not receive any salary for their services, but by resolution of the Board of Directors a fixed sum of expenses of attendance may be allowed for attendance at such meeting of the Board of Directors.

Section 5 -- Rules and Regulations. The Board of Directors shall have power to make and adopt such rules and regulations not inconsistent with law, the certificate of incorporation or these by-laws, as they may deem advisable for the management, administration and regulation of the business and affairs of the corporation. And no debt shall be contracted against the corporation except by order of the Board of Directors.

Section 6 -- Accounting System. The Board of Directors shall cause to be established and maintained, a complete accounting system of the finances of the corporation; all accounts of the corporation shall be audited annually, by a committee of not less than three appointed by the board of directors, or an auditor, and a report thereof submitted to the stockholders at the annual meeting.

Section 7 -- Meetings of Directors. A regular meeting of the Board of Directors shall be held without notice other than this by-law, immediately after the annual meeting of stockholders.

Section 8 -- Special Meetings. Special meetings of the Board of Directors may be called by the president or any two directors. Notice of the time, place and purpose of any special meeting of the Board of Directors shall be given at least 24 hours previous thereto by verbal

notice given personally or written notice mailed to each director at his proper post office address. Special meetings may be held at any time and place and without notice by unanimous consent of the Board.

Section 9 -- Quorum. A majority of the Board of Directors shall constitute a quorum for the transaction of business, and if less than a majority i.s present at such meeting, a majority of those present may adjourn the meeting from time to time without further notice.

Section 10 -- Manner of Acting. The act of the majority of the directors present at a meeting at which a quorum is present shall be the act of the Board of Directors.

Section 11 -- Inspection of Irrigation System. To the end that all directors shall be familiar with the irrigation system and works of the corporation, as, well as its needs, the directors shall, as a body, as soon as convenient after their election make an inspection of the canal system and works of the corporation.

ARTICLE V -- Officers

Section 1 -- Number. The officers of the corporation shall be a president, vice president, secretary and treasurer. The office of the secretary and treasurer may be held by the same person.

Section 2. Election and Term of Office. The officers shall be elected by ballot annually by and from the Board of Directors following the annual meeting of stockholders. Each officer shall hold office until the first meeting of the Board of Directors following the next succeeding meeting of the stockholders, or until his successor shall have been duly elected and qualified. The office of the secretary and treasurer may be held by a person other than a stockholder.

Section 3 -- Removal. Any employee or agent elected or appointed by the Board of Directors may be removed by the Board of Directors whenever in its judgment the best interests of the corporation will be served thereby.

Section 4 -- President. The president shall be the executive officer of the Corporation and shall sign all official documents of the company, preside at all meetings of the Board and Stockholders' meetings and, under the direction of the Board, shall have general supervision of the business and affairs of the corporation.

Section 5 -- Vice President. In the absence or inability of the president to act, the vice president shall act in his place and stead and shall perform such other duties as from time to time may be assigned to him by the Board of Directors.

Section 6 -- Secretary. The secretary shall:

a. Keep the minutes of the meetings of the stockholders and the board of directors.

b. See that all notices are duly given in accordance with these by-laws, or as required by law.

c. Be custodian of the corporate records and of the seal of the corporation, and see that the seal of the corporation is affixed to all stock certificates prior to the issuance thereof, and to all documents, the execution of which on behalf of the corporation under its seal is duly authorized in accordance with the provisions of these by-laws.

d. Keep a register of the post office addresses of each stockholder, as furnished by such stockholder.

e. Sign with the president, certificates of stock, the issuance of which shall have been duly authorized by resolution of the board of directors.

f. Have general charge of the books of the corporation.

g. In general, perform all duties incident to the office of secretary, and such other duties as from time to time may be assigned to him by the board of directors.

Section 7 -- Treasurer. The treasurer shall:

a. Have charge and custody of and be responsible for all funds and securities of the corporation.

b. Receive and give receipts for moneys due and payable to the corporation from any source whatsoever, and deposit all such moneys in the name of the corporation in such bank or banks as shall be designated by the board of directors.

c. In general, perform all the duties incident to the office of treasurer, and such other duties as from time to time may be assigned to him by the board of directors.

Section 8 -- Officers and Employees. The board of directors shall fix the compensation of any and all agents and employees or the corporation.

Section 9 -- Reports. The officers of the corporation shall submit at each annual meeting of the stockholders reports of their respective departments, covering the business of the corporation for the previous fiscal year.

ARTICLE VI -- Stock Certificates

Section 1 -- Certificates. Stock of the corporation shall be evidenced by certificate which shall be in such form and contain such provisions as shall be determined by the Board of Directors; such certificate shall be signed by the president and by the secretary of the corporation, and the corporate seal shall be affixed thereto.

Section 2 -- Transfer of Stock. No transfer of stock shall be made except upon the books of the company, either in person or by attorney, and the books of the company shall show from whom and to whom such transfer was made, the date thereof, the number of the original certificate, the number of original shares, and the number of shares transferred. Before issuing any new certificate of stock the old certificate shall be delivered to the company and shall be cancelled and filed in the records of the company. No certificate of stock shall be transferred

while the assignor of said certificate is indebted to the company. The board of directors shall determine the fee to be charged for issuing stock certificates.

Section 3 -- Lost Certificate. In case of a lost, destroyed or mutilated certificate, a new certificate may be issued therefor upon such terms and such indemnity to the corporation as the Board of Directors may prescribe.

ARTICLE VII -- Assessments

Section 1 -- Levy of Assessments. The stockholders, at the annual meeting of the corporation, shall levy an assessment on the capital stock of the company, to be levied pro rata on all shares of stock, payable in money, for the purpose of keeping the property of the corporation in good repair and for the payment of any claim against the corporation not otherwise provided for. In the event the stockholders should fail to make a levy, the Board of Directors shall have power to levy from time to time assessments for the operation and

. maintenance of the reservoirs, canals and other works owned by the corporation, such assessment, however, made by the Board of Directors shall not exceed funds to cover necessary operation and maintenance.

Limitation on Assessments. The Board of Directors shall have authority to incur indebtedness and expenses in the normal operation of the company; provided, however, that no indebtedness, bonded or otherwise, or expenses, shall be incurred which exceeds the limit set by the stockholders at the Annual Meeting. Any indebtedness or expenses contemplated by the Board of Directors which shall exceed the Stockholder limit shall be incurred only by a majority vote of the stockholders at any annual or special meeting of the stockholders.[2]

Section 2 -- Lien. The corporation shall have a first lien upon the outstanding stock to secure payment of any and all assessments voted by the stockholders at a regular or special meeting, or levied by the Board of Directors in accordance with the provisions of Section 1 of this article, and no transfer of stock upon the books of the corporation shall be made upon which the corporation has a lien.

Section 3 -- Sale. If any stockholder shall fail to pay, within the time set by the Board of Directors any assessment or assessments which may be levied against his stock, the Board of Directors may proceed to sell the stock of said stockholder, or so much thereof as may be necessary, to pay the amount of the assessment or assessments. All delinquent assessments shall bear interest at the rate of 18% per annum from the date of delinquency until paid. The board of directors have the right to shut off water with non-payment of assessment.

Section 4 -- Notice of Sale. Whenever the Board of Directors shall order the sale of stock for delinquent assessments, it shall be the duty of the secretary of the corporation to notify the owner of said stock in writing, by registered mail, and by advertising the sale of said stock in a newspaper published in Delta County, said notice and said advertisement to state the total amount due on said stock and the date and hour of said sale, which shall not be less than thirty (30) days from the date that the notice to such stockholder is deposited in the post office.

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[2] Amended Feb. 2, 2006.

Section 5 -- Confirming Sale. It shall be the duty of the secretary to report to the Board of Directors at their next meeting any sale of stock sold for delinquent assessments, and the Board of Directors shall take action confirming or rejecting such sale.

ARTICLE VIII -- Use of Water

Each share of the capital stock of the corporation shall entitle its holder of record on the books of the corporation to the use each year of a pro rata share of all the water carried and deposited in the water ways of the corporation. The Board of Directors shall provide rules and regulations and shall supervise and determine the disposition of the water.

ARTICLE IX -- Superintendent

Section 1 -- Duties. The Superintendent, under the supervision and direction of the Board of Directors, shall have full charge of the division boxes and the distribution of water, and shall require the ditch riders to keep the boxes in good repair.

Section 2 -- Numbering Boxes. Beginning at the upper end of the ditch, boxes shall be numbered consecutively, and each year the ditch riders shall be furnished with a list of water users by name and number, with the number of shares allotted to each box; such list may be copied by any water user.

Section 3 -- Installation. No new outlet structures shall be installed in the Fruitland Ditch. The Company shall maintain and renew the division structures when necessary.[3]
If essential, a water user may have more than one box--but shall be held strictly accountable that no more water is used in his boxes than he is entitled to and that replacement boxes for existing be pipe and gate.

Fruitland Irrigation Company will install approved standardized water measuring devices as deemed necessary by the Company at the expense of the Shareholder. The cost of the structure will be billed to the shareholder as a special assessment. [4]

Water may be changed from one box or user to another; however, if it shall appear that such shifting or the diversion of water shall seriously impair the equilibrium of the flow of water in the ditch, the Board of Directors shall make an equitable regulation of the matter.

Section 4 -- Superintendent Shall Attend Meetings. The Superintendent shall receive notice of and attend all meetings of the Board of Directors, and shall report the condition of the irrigation system of the corporation to the stockholders at all annual meetings.

ARTICLE X -- Fiscal Year

The fiscal year of the corporation shall begin on the first day of December of each year and end on the 30th day of November of the following year.[5]

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3 Amended Feb. 2, 2006.
4 Amended Jan 12, 2016
5 Amended Feb. 2, 2006.

ARTICLE XI -- Reserved

ARTICLE XII -- Amendments

These by-laws may be altered, amended or repealed by the stockholders at any regular or special meeting, providing that notice of such meeting provide notice of the proposed change in the by-laws.[6]

ARTICLE XIII -- Repeal

The foregoing by-laws shall supersede and replace all former by-laws of this corporation, and all other by-laws in conflict herewith be and the same are hereby repealed.

* * * *

The foregoing by-laws were adopted by the stockholders of THE FRUITLAND IRRIGATION COMPANY at an annual stockholders' meeting duly and regularly held on the 14th day of January, 1984, and amended as indicated herein, and the original copy of said by-laws, as adopted, made a part of the minutes of said meeting and duly incorporated therein.

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6 Amended Feb. 2, 2006.

Appendix B

Water Rights Summary

And

State Engineer Diversion Reports

Structure Summary Report

State of Colorado HydroBase

Structure Name: FRUITLAND CANAL **Water District:** 40 **Structure ID Number:** 549

Source: Crystal Creek

Location:	Q10	Q40	Q160	Section	Twnshp	Range	PM
	NE	NW	SE	34	50N	6W	N

Distance From Section Lines: From N/S Line: 2245 S From E/W Line: 1485 E

UTM Coordinates (NAD 83): Northing (UTM y): 4270244 Easting (UTM x): 280199 Spotted from PLSS distances from section lines

Latitude/Longitude (decimal degrees): 38.553478 -107.522398

Water Rights Summary:							
Total Decreed Rate(s) (CFS):	Absolute:	537.1375	Conditional:	0.0000	AP/EX:	0.0000
Total Decreed Volume(s) (AF):	Absolute:	0.0000	Conditional:	0.0000	AP/EX:	0.0000

Water Rights -- Transactions

Case Number	Adjudication Date	Appropriation Date	Administration Number	Order Number	Priority Number	Decreed Amount	Adjudication Type	Uses	Action Comment
CA0617	1914-06-23	1901-05-17	21263.18764	0	A65	67.4375 C	S	1	P361 67.4375CFS ALT PT TO MEEK DIV. TUNNEL W-1827
CA2030	1930-02-10	1901-05-17	25807.18764	0		300.0000 C	S	1	FILLING DECREE FOR ONION VALLEY RES P 1047
CA2030	1930-02-10	1914-07-01	25807.23557	0	G84	74.7000 C	S	1	HGT ON R BANK. P919
CA3503	1954-03-20	1901-05-17	31924.18764	0	J86	40.0000 C	S	1Q	FOR STORAGE. P1870
CA3503	1954-03-20	1901-05-17	31924.18764	0	J84	5.0000 C	S	8	P1870
CA3503	1954-03-20	1901-05-17	31924.18764	0	J85	40.0000 C	S	1	P1870
CA3503	1954-03-20	1901-05-17	31924.18764	0	J83	10.0000 C	S	89	P1869
94CW0018	1964-01-31	1957-11-13	39398.00000	0	K152	600.0000 C	S,C,AB	1	CANCELLED FOR LACK OF DILIGENCE IN THIS
CA4808	1964-01-31	1957-11-13	39398.00000	0	K152	600.0000 C	S,C	1	P2792

Water Rights -- Net Amounts

Adjudication Date	Appropriation Date	Administration Number	Order Number	Priority/Case Number	Rate (CFS)			Volume (Acre-Feet)		
					Absolute	Conditional	AP/EX	Absolute	Conditional	AP/EX
1914-06-23	1901-05-17	21263.18764	0	A65	67.4375	0	0			
1930-02-10	1901-05-17	25807.18764	0	CA2030	300.0000	0	0			
1930-02-10	1914-07-01	25807.23557	0	G84	74.7000	0	0			
1954-03-20	1901-05-17	31924.18764	0	J86	95.0000	0	0			

Irrigated Acres Summary -- Totals From Various Sources

GIS Total (Acres):	5890.705	Reported:	2010
Diversion Comments Total (Acres):	5000	Reported:	2006
Structure Total (Acres):		Reported:	

Irrigated Acres From GIS Data

Year	Land Use	Acres Flood	Acres Furrow	Acres Sprinkler	Acres Drip	Acres Groundwater	Acres Total
1993	***Year Total***	512.16	3309.73	663.58	0	0	7023.83
1993	ALFALFA	0	722.89	587.14	0	0	1522.38
1993	GRASS_PASTURE	512.16	2486.47	76.44	0	0	5401.08
1993	SMALL_GRAINS	0	100.37	0	0	0	100.37
2000	***Year Total***	681.20	2814.93	615.16	0	0	5353.86
2000	ALFALFA	0	36.35	63.74	0	0	219.37
2000	GRASS_PASTURE	681.20	2668.22	515.29	0	0	4949.54
2000	SMALL_GRAINS	0	110.36	36.13	0	0	184.96
2005	***Year Total***	570.14	3091.05	411.83	0	0	5810.41
2005	ALFALFA	0	83.20	63.74	0	0	195.38
2005	GRASS_PASTURE	525.67	2211.58	301.46	0	0	4203.61
2005	SMALL_GRAINS	44.47	796.27	46.63	0	0	1411.42
2010	***Year Total***	663.35	3056.44	651.90	0	0	5890.71
2010	ALFALFA	0	28.98	85.68	0	0	132.22
2010	GRASS_PASTURE	663.35	3014.22	566.23	0	0	5745.25
2010	SMALL_GRAINS	0	13.24	0	0	0	13.24

Diversion Summary in Acre-Feet - Total Water Through Structure

Year	FDU	LDU	DWC	Maxq & Day	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Total
1970	1970-05-03	1970-08-23	113	300 05-17	0	0	0	0	0	0	9592	6976	4102	2920	0	0	23590
1971	1971-04-14	1971-08-08	115	133 06-07	0	0	0	0	0	1938	6133	6907	3739	1031	0	0	19748
1972	1972-03-23	1972-06-10	70	41 04-10	0	0	0	0	512	1244	716	357	0	0	0	0	2828
1973	1973-04-24	1973-07-08	76	350 05-11	0	0	0	0	0	1198	8789	7696	377	0	0	0	18060
1974	1974-03-20	1974-06-17	90	283 05-06	0	0	0	0	119	3154	8654	1595	0	0	0	0	13522
1975	1975-04-21	1975-07-13	84	267 06-16	0	0	0	0	0	662	7342	8801	1686	0	0	0	18492
1976	1976-03-18	1976-06-13	88	55 05-15	0	0	0	0	212	1744	2044	621	0	0	0	0	4622
1977	1977-04-09	1977-05-22	26	65 05-08	0	0	0	0	0	456	2009	0	0	0	0	0	2465
1978	1978-04-06	1978-07-13	99	260 05-16	0	0	0	0	0	2608	6879	6744	740	0	0	0	16971
1979	1979-04-20	1979-07-04	76	172 05-25	0	0	0	0	0	1008	6244	5108	270	0	0	0	12629
1980	1980-04-23	1980-07-09	78	140 06-17	0	0	0	0	0	1634	6482	7373	1139	0	0	0	16628
1981	1981-04-16	1981-06-14	49	49 05-01	0	0	0	0	0	897	687	261	0	0	0	0	1845
1982	1982-04-27	1982-07-05	70	156 05-04	0	0	0	0	0	353	5096	4914	238	0	0	0	10601
1983	1983-04-27	1983-08-07	103	164 05-09	0	0	0	0	0	557	5369	7694	4461	139	0	0	18220
1984	1984-05-17	1984-07-18	63	227 06-22	0	0	0	0	0	0	2674	10887	4445	0	0	0	18006
1985	1985-05-06	1985-10-31	82	150 06-12	0	0	0	0	0	0	2836	6883	139	0	0	496	10354
1986	1986-05-06	1986-07-01	57	100 05-15	0	0	0	0	0	0	4622	4760	50	0	0	0	9432
1987	1987-05-07	1987-06-22	47	122 05-15	0	0	0	0	0	0	4789	2297	0	0	0	0	7086
1988	1988-04-28	1988-06-19	53	83 05-17	0	0	0	0	0	96	2627	1742	0	0	0	0	4465
1989	1989-05-10	1989-06-07	22	60 05-10	0	0	0	0	0	0	1315	139	0	0	0	0	1454
1990	1990-05-21	1990-06-10	16	30 06-06	0	0	0	0	0	0	466	298	0	0	0	0	764
1991	1991-05-08	1991-06-18	42	175 05-13	0	0	0	0	0	0	3751	2341	0	0	0	0	6092
1992	1992-04-24	1992-06-25	63	219 05-01	0	0	0	0	0	750	9934	4641	0	0	0	0	15326
1993	1993-05-06	1993-07-13	69	300 05-06	0	0	0	0	0	0	9707	7766	1653	0	0	0	19126
1994	1994-05-05	1994-06-09	36	118 05-11	0	0	0	0	0	0	4305	1260	0	0	0	0	5565
1995	1995-05-05	1995-10-31	180	219 05-17	0	0	0	0	0	0	8561	7377	5011	1230	1190	1230	24598
1996	1996-04-29	1996-06-18	51	135 05-16	0	0	0	0	0	279	5320	956	0	0	0	0	6555
1997	1997-05-09	1997-07-01	54	123 06-07	0	0	0	0	0	0	4578	6040	80	0	0	0	10699
1998	1998-05-07	1998-07-05	60	129 06-02	0	0	0	0	0	0	5119	5625	295	0	0	0	11039
1999	1999-04-30	1999-06-24	56	135 05-19	0	0	0	0	0	219	6179	3173	0	0	0	0	9572
2000	2000-04-10	2000-06-07	59	135 04-28	0	0	0	0	0	4497	7035	282	0	0	0	0	11813
2001	2001-05-01	2001-05-29	29	250 05-14	0	0	0	0	0	0	7076	0	0	0	0	0	7076
2002	2002-04-04	2002-04-25	22	77 04-04	0	0	0	0	0	2416	0	0	0	0	0	0	2416
2003	2003-04-15	2003-06-15	55	123 05-30	0	0	0	0	0	2572	3767	2363	0	0	0	0	8702
2004	2004-05-06	2004-05-23	18	50 05-06	0	0	0	0	0	0	1785	0	0	0	0	0	1785
2005	2005-05-13	2005-06-09	28	41 05-31	0	0	0	0	0	0	1082	737	0	0	0	0	1819
2006	2006-04-14	2006-06-12	60	204 04-21	0	0	0	0	0	5209	5373	791	0	0	0	0	11372
2007	2007-04-18	2007-06-14	58	110 05-16	0	0	0	0	0	523	2985	319	0	0	0	0	3828
2008	2008-05-10	2008-07-15	67	168 05-21	0	0	0	0	0	0	5171	6068	610	0	0	0	11848
2009	2009-04-06	2009-07-12	98	120 04-27	0	0	0	0	0	1965	5256	3503	317	0	0	0	11040
2010	2010-04-22	2010-06-27	67	168 04-22	0	0	0	0	0	1784	5338	5181	0	0	0	0	12303
2011	2011-04-01	2011-07-12	109	232 05-30	0	0	0	0	0	2665	6752	6833	1269	0	0	0	17519
2012	2012-04-16	2012-05-29	32	20 04-30	0	0	0	0	0	176	399	0	0	0	0	0	575
2013	2013-05-14	2013-06-10	27	48 05-27	0	0	0	0	0	0	774	468	0	0	0	0	1242
2014	2014-04-15	2014-06-16	69	142 06-02	0	0	0	0	0	2930	4471	3900	0	0	0	0	11300
2015	2015-03-30	2015-06-22	91	170 05-06	0	0	0	0	186	1755	3612	4207	0	0	0	0	9761
2016	2016-05-08	2016-07-03	62	85 06-06	0	0	0	0	0	0	2390	2279	37	0	0	0	4706

Minimum:	20	0	0	0	0	0	0	0	0	0	0	0	0	575
Maximum:	350	0	0	0	0	512	5209	9934	10887	5011	2920	1190	1230	24598
Average:	147	0	0	0	0	22	964	4598	3578	652	113	25	37	9988

47.00 years with diversion records

Notes: The average considers all years with diversion records, even if no water is diverted.
The above summary lists total monthly diversions.
* = Infrequent Diversion Record. All other values are derived from daily records.
Average values include infrequent data if infrequent data are the only data for the year.

Diversion Comments

IYR	NUC Code	Acres Irrigated	Comment
1970		5650	
1971		5650	
1972		5670	
1973		5000	
1974		5000	
1975		5000	
1976		5000	
1978		5000	
1979		5000	
1980		5000	
1981		5000	
1983		5000	
1984		5000	
1985		5000	
1986		5	
1987		5000	
1988		5000	
1989		5000	
1990		5000	
1991		5000	
1992		5000	
1993		5000	
1994		5000	
1995		5000	
1996		5000	
1997		5000	
1998		5000	
1999		5000	
2000		5000	
2001		5000	
2002		5000	
2003		5000	
2004		5000	
2005		5000	
2006		5000	

Note: Diversion comments and reservoir comments may be shown for a structure, if both are available.

Structure Summary Report

State of Colorado

HydroBase

Structure Name: FRUITLAND RESERVOIR **Water District:** 40 **Structure ID Number:** 3395

Source: Crystal Creek

Location:	Q10	Q40	Q160	Section	Twnshp	Range	PM
	SW	NW	NW	18	50N	6W	N

Distance From Section Lines: From N/S Line: 792 N From E/W Line: 335 W

UTM Coordinates (NAD 83): Northing (UTM y): 4275957 Easting (UTM x): 274394 Spotted from PLSS distances from section lines

Latitude/Longitude (decimal degrees): 38.603457 -107.590801

Water Rights Summary:						
Total Decreed Rate(s) (CFS):	Absolute:	0.0000	Conditional:	0.0000	AP/EX:	0.0000
Total Decreed Volume(s) (AF):	Absolute:	10167.9500	Conditional:	0.0000	AP/EX:	0.0000

Water Rights -- Transactions

Case Number	Adjudication Date	Appropriation Date	Administration Number	Order Number	Priority Number	Decreed Amount	Adjudication Type	Uses	Action Comment
CA0617	1914-06-23	1901-05-17	21263.18764	0	A7	2800.0000 AF	S	1	440
CA2030	1930-02-10	1901-05-17	25807.18764	0	G3.5	3884.9500 AF	S,CA	1	AKA ONION VALLEY RES CA 3/1/1932 P1047
CA2030	1930-02-10	1901-05-17	25807.18764	0	G3.5	2483.0000 AF	S	1	AKA ONION VALLEY RES 3/1/1932. P1052
CA2030	1930-02-10	1901-05-17	25807.18764	0	G3.5	6417.0000 AF	S,C	1	AKA ONION VALLEY RES 3/1/1932. P1051
CA2030	1930-02-10	1901-05-17	25807.18764	0	G3.5	2532.0500 AF	S,C,AB	1	AKA ONION VALLEY RES CA 2030 3/1/1932 P1051
CA0126	1954-03-20	1949-09-01	36403.00000	0	J344	1532.0500 AF	S,C,AB	1	CW74 126 ABN PART OF
CA3503	1954-03-20	1949-09-01	36403.00000	0	J344	1000.0000 AF	S,CA	1	AKA FRUITLAND RES GOULD RES P3494 P2207
CA3503	1954-03-20	1949-09-01	36403.00000	0	J344	2532.0500 AF	S,C	1	AKA FRUITLAND RES. GOULD RES. P2207

Water Rights -- Net Amounts

Adjudication Date	Appropriation Date	Administration Number	Order Number	Priority/Case Number	Rate (CFS)			Volume (Acre-Feet)		
					Absolute	Conditional	AP/EX	Absolute	Conditional	AP/EX
1914-06-23	1901-05-17	21263.18764	0	A7				2800.0000	0	0
1930-02-10	1901-05-17	25807.18764	0	G3.5				6367.9500	0	0
1954-03-20	1949-09-01	36403.00000	0	J344				1000.0000	0	0

Irrigated Acres Summary -- Totals From Various Sources

GIS Total (Acres):		Reported:	
Diversion Comments Total (Acres):	0	Reported:	2006
Structure Total (Acres):		Reported:	

Irrigated Acres From GIS Data

Year	Land Use	Acres Flood	Acres Furrow	Acres Sprinkler	Acres Drip	Acres Groundwater	Acres Total

No data available for this report

Diversion Summary in Acre-Feet - Total Water Through Structure

Year	FDU	LDU	DWC	Maxq & Day	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Total
1975	1975-06-22	1975-09-02	64	70 07-25	0	0	0	0	0	0	0	298	2707	3757	577	0	7339
1976	1976-05-06	1976-07-07	55	55 06-14	0	0	0	0	0	0	1392	2652	704	0	0	0	4748
1978	1978-05-03	1978-09-07	88	60 08-16	0	0	0	0	0	0	1190	143	3001	3541	1091	0	8965
1979	1979-07-05	1979-10-16	105	92 07-05	0	0	0	0	0	0	0	0	4415	3023	702	35	8175
1980	1980-07-01	1980-09-05	69	75 07-01	0	0	0	0	0	0	0	0	4028	3624	970	0	8622
1981	1981-05-06	1981-06-14	40	59 05-06	0	0	0	0	0	0	2713	1246	0	0	0	0	3959
1982	1982-06-15	1982-07-27	44	61 07-02	0	0	0	0	0	0	0	1287	3354	0	0	0	4641
1984	1984-07-10	1984-09-17	49	65 09-12	0	0	0	0	0	0	0	0	1935	2476	739	0	5150
1985	1985-07-24	1985-09-09	48	70 08-19	0	0	0	0	0	0	0	0	984	3818	998	0	5800
1986	1986-07-08	1986-09-05	66	63 09-05	0	0	0	0	0	0	0	0	2197	3285	1176	0	6658
1987	1987-06-25	1987-08-21	68	68 08-21	0	0	0	0	0	0	0	702	3457	3857	0	0	8016
1988	1988-06-22	1988-07-06	17	84 07-06	0	0	0	0	0	0	0	980	1016	0	0	0	1995
1989	1989-06-01	1989-06-01	11	65 06-01	0	0	0	0	0	0	0	1418	0	0	0	0	1418
1991	1991-06-15	1991-08-02	53	65 06-24	0	0	0	0	0	0	0	1974	3858	615	0	0	6446
1992	1992-06-29	1992-08-27	60	60 07-14	0	0	0	0	0	0	0	206	3385	2923	0	0	6514
1993	1993-07-20	1993-08-27	43	51 07-20	0	0	0	0	0	0	0	0	1165	3039	0	0	4203
1994	1994-06-17	1994-08-06	51	64 08-06	0	0	0	0	0	0	0	1166	2995	702	0	0	4864
1995	1995-07-27	1995-08-08	39	55 07-27	0	0	0	0	0	0	0	0	545	3144	298	0	3987
1995 *																	8612
1996 *																	5469
1996	1996-06-10	1996-07-23	66	66 07-23	0	0	0	0	0	0	0	1767	3804	1833	0	0	7404
1997	1997-07-02	1997-08-24	60	50 07-18	0	0	0	0	0	0	0	0	2229	2380	595	0	5205
1997 *																	9851
1998 *																	8978
1998	1998-05-05	1998-08-01	114	50 05-05	0	0	0	0	0	0	2678	2975	3074	2579	0	0	11306
1999	1999-06-01	1999-07-16	60	70 06-01	0	0	0	0	0	0	0	4165	3868	0	0	0	8033
1999 *																	7922
2000 *																	10746
2000	2000-05-09	2000-06-30	67	70 05-09	0	0	0	0	0	0	3193	4165	1944	0	0	0	9303
2001	2001-06-01	2001-06-01	41	60 06-01	0	0	0	0	0	0	0	3570	1309	0	0	0	4879
2001 *																	5559
2002 *																	4283
2002	2002-05-01	2002-05-02	32	65 05-02	0	0	0	0	0	0	3927	129	0	0	0	0	4056
2003	2003-06-07	2003-06-27	36	68 06-27	0	0	0	0	0	0	0	3118	1619	0	0	0	4737
2003 *																	5492
2004 *																	9897
2004	2004-04-09	2004-07-01	95	188 05-07	0	0	0	0	0	4777	5812	4376	1666	0	0	0	16631
2005	2005-04-14	2005-07-19	99	283 05-21	0	0	0	0	0	3682	8318	5755	2618	0	0	0	20373
2005 *												587	517				1104
2006	2006-05-07	2006-08-01	88	68 05-07	0	0	0	0	0	0	3372	3818	3465	218	0	0	10874
2007 *																	8430
2008 *																	9568
2009 *																	7279
2009	2009-03-24	2009-04-27	42	120 04-27	0	0	0	0	175	2060	952	0	0	0	0	0	3186
2010 *					346	248	180	94	696	2737	2410	2559	106	178	44	106	9704
2011 *																	16196
2012 *																	3365
2013	2013-04-23	2013-06-10	55	154 04-30	0	0	0	0	0	580	5552	1301	0	0	0	0	7433
2014 *					490	169	621	204	676	4522	884	1420	130	11	0	9	9135
2015 *					251	54	71	135	2737	1964	2589	1007					8808
2016 *					176	34	1208	178	1869	3795	850	604	149	62	5	5	8936

Minimum:	50	0	0	0	0	0	0	0	0	0	0	0	0	1104
Maximum:	283	490	248	1208	204	2737	4777	8318	5755	4415	3857	1176	106	20373
Average:	80	36	14	59	17	176	689	1310	1483	1893	1325	212	5	7338

51.00 years with diversion records

Notes: The average considers all years with diversion records, even if no water is diverted.
The above summary lists total monthly diversions.
* = Infrequent Diversion Record. All other values are derived from daily records.
Average values include infrequent data if infrequent data are the only data for the year.

Diversion Comments

IYR	NUC Code	Acres Irrigated	Comment
1970		0	ACREAGE COVERED BY FRUITLAND CANAL
1971		0	ACREAGE COVERED BY FRUITLAND CANAL
1972		0	ACREAGE COVERED BY FRUITLAND CANAL
1973			ACREAGE COVERED BY FRUITLAND CANAL
1974			ACREAGE COVERED BY FRUITLAND CANAL
1975		5000	
1978			@ACREAGE COVERED@
1979			ACREAGE COVERED BY FRUITLAND CANAL
1980			ACREAGE COVERED BY FRUITLAND CANAL
1981		5000	ACREAGE COVERED BY FRUITLAND CANAL
1983			ACREAGE COVERED BY FRUITLAND CANAL
1984			ACREAGE COVERED BY FRUITLAND CANAL
1985			ACREAGE COVER BY ID 0549.
1986			ACREAGE COVERED BY FRUITLAND CANAL
1987		0	ACREAGE COVERED BY FRUITLAND CANAL
1988		0	ACREAGE COVERED BY FRUITLAND CANAL
1989		0	ACREAGE COVERED BY FRUITLAND CANAL
1990		0	ACREAGE COVERED BY FRUITLAND CANAL
1991		0	ACREAGE COVERED BY FRUITLAND CANAL
1992		0	ACREAGE COVERED BY FRUITLAND CANAL
1993		0	ACREAGE COVERED BY FRUITLAND CANAL
1994		0	ACREAGE COVERED BY FRUITLAND CANAL
1995		0	ACREAGE COVERED BY FRUITLAND CANAL
1996		0	ACREAGE COVERED BY FRUITLAND CANAL
1997		0	ACREAGE COVERED BY FRUITLAND CANAL
1998		0	ACREAGE COVERED BY FRUITLAND CANAL
1999		0	ACREAGE COVERED BY FRUITLAND CANAL
2000		0	ACREAGE COVERED BY FRUITLAND CANAL
2001		0	ACREAGE COVERED BY FRUITLAND CANAL
2002		0	ACREAGE COVERED BY FRUITLAND CANAL
2003		0	ACREAGE COVERED BY FRUITLAND CANAL ID 549
2004		0	ACREAGE COVERED BY FRUITLAND CANAL ID 549
2005		0	ACREAGE COVERED BY FRUITLAND CANAL ID 549
2006		0	ACREAGE COVERED BY FRUITLAND CANAL ID 549
2007			ACREAGE COVERED BY FRUITLAND CANAL ID 549

Note: Diversion comments and reservoir comments may be shown for a structure, if both are available.

Appendix C

Applegate Group Inc.
Report of Alternatives Analysis
And Cost Estimate

Fruitland Irrigation Company
2016 Feasibility Study

Fruitland Irrigation Company
Crawford, CO

Delta Conservation District
Delta, CO

Applegate Group, Inc.
Water Resource Advisors for the West
www.applegategroup.com
303-452-6611

TABLE OF CONTENTS

INTRODUCTION

This study is funded through a grant provided by the Delta Conservation District (DCD) and the Colorado Water Conservation Board (CWCB). The purpose of the study is to determine what improvements are needed or could be made to the Fruitland Irrigation System in order to improve the system efficiency and reliability.

The Fruitland Irrigation system diverts water from Crystal Creek and transports it across a divide into a separate drainage basin via the Highline Canal. Due to the relatively junior nature of the FIC water rights the highline canal only runs during peak runoff. Once direct diversions are called out the system relies on storage from Gould Reservoir delivered through the Gould Canal. Storage water is released at a relatively constant rate of about 60 cfs and typically runs out in early to mid-August. Water is primarily divided by using submerged orifices sized according to the number of shares allocated to the turnout. Some diversions include measuring devices but many do not.

IRRIGATED AREA

GIS Data from the Colorado Water Conservation District (CWCB) was used to estimate the irrigated area under the Fruitland system. The irrigated area under the Gould Canal slopes relatively steeply away from the main canal which has resulted in some users harnessing the elevation drop to pressurize sprinklers for their pastures. GIS data was evaluated in order to determine the area irrigated by sprinklers compared to the amount of flood irrigation. Many of the flood irrigated pastures use gated pipe to improve water distribution. Aerial imagery was used to identify sprinkler irrigated pastures and separate them from the flood irrigated pastures. The aerial imagery also indicates that not all the flood irrigated pastures are currently irrigated although they may have been farmed and irrigated in the past. A cursory evaluation of the data estimates that about half of this area is currently irrigated and the other half is dryland or fallow ground. The Delta Conservation District conducted a Water Management Plan (WMP) in 2002 and estimated the irrigated area. The irrigated area is summarized in the table below.

Source	Sprinkler Irrigation	Flood Irrigation	Total
CWCB GIS Data	n/a	n/a	7,863
CWCB Diversion Records	n/a	n/a	5,000
This Study Est.	2,425	2,719	5,144
DCD 2002 WMP	n/a	n/a	5,000

WATER BUDGET

The WMP estimated that the amount of water diverted by the FIC ranged from 4,186 acre feet in 2002 to 25,014 acre feet in 1995 with an average of 17,352 acre feet. Crop water demand was estimated to be 11,360 acre feet in an average year. Water diversions are typically unable to meet the crop demand after mid-June on average. Water is then released from storage at a rate of approximately 65 cfs. This release rate corresponds well to a maximum crop water demand of 0.23 inches per day. Meeting the crop water demand with 100% system efficiency over 5,144 acres would require approximately 50 cfs. The overall system efficiency is nearly 77 percent using the numbers above which is high compared to other nearby systems and has likely been driven by the overall shortage of water.

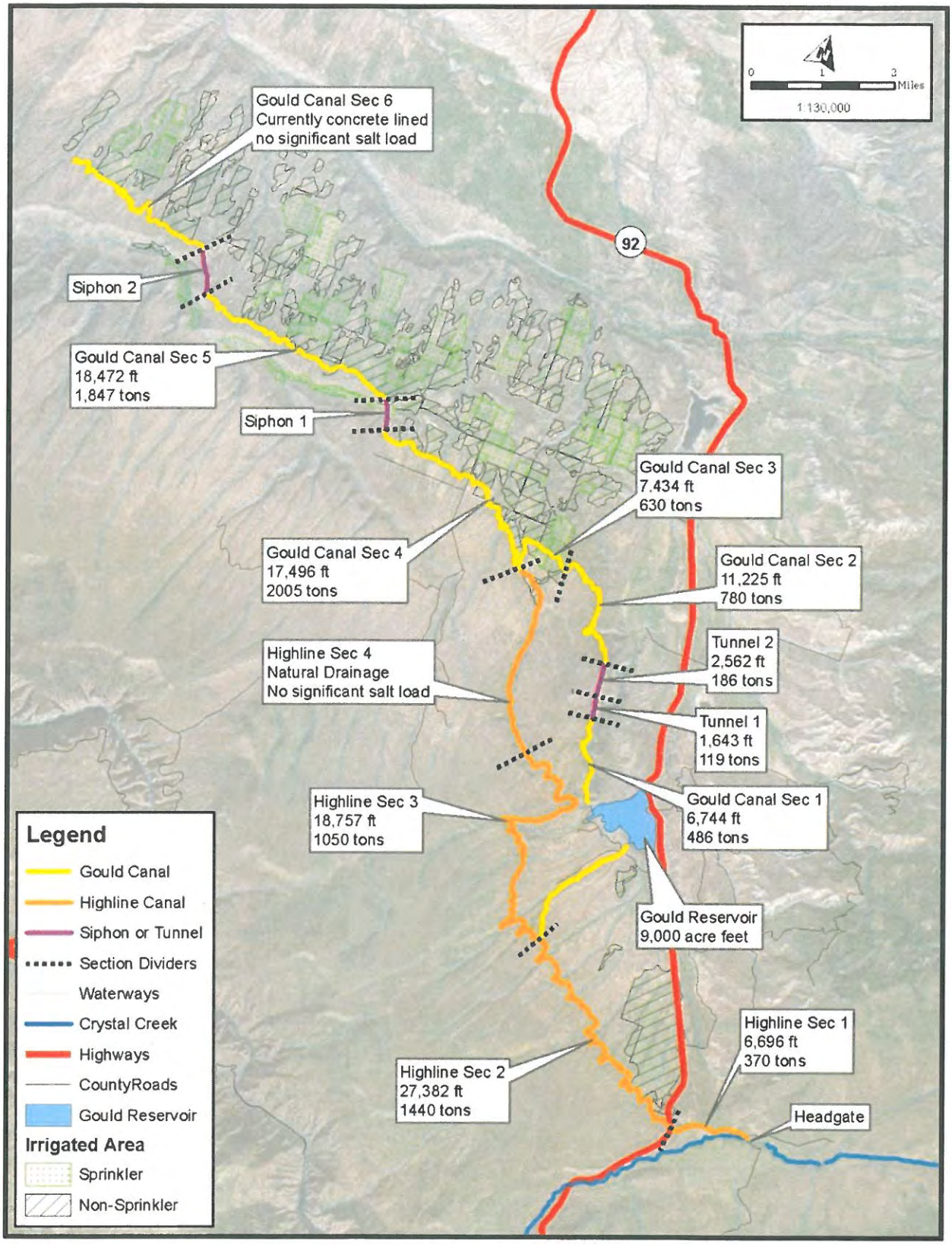


FIGURE 1 SYSTEM OVERVIEW

2015 STUDY

A previous study, also funded by the DCD and CWCB evaluated the possibility of combining the upper part of the Fruitland system with the Cattleman's Ditch. The main goal of this evaluation was to determine if such a combination would improve overall efficiencies and qualify for grant money available through the Salinity Control Funding Opportunity Announcement (FOA) in 2015. It was concluded that combining these two systems was not efficient due to the short duration and high flows historically present on the Highline Canal. Sizing a pipe or lined canal to carry up to 500 cfs would be costly. The salinity benefits were relatively small, however, due to the short duration of the high flows in the Highline Canal.

Another portion of this study evaluated the possibility of eliminating sections 3 and 4 of the Highline Canal. This would require all water delivered to the service area to be carried through Gould Reservoir and would require an enlargement of the Gould Canal. Enlarging this canal would prove to be very costly due to the presence of two tunnels and difficult construction access. There was also limited salinity benefits, and thereby limited grant money available, associated with this option due to the section 4 of the highline canal coinciding with a natural drainage.

2016 STUDY

Following the 2015 study it was determined that the Gould Canal should be evaluated to identify and beneficial projects that could have funding potential through the salinity control program. The WMP determined that up to 3.7 cfs was lost to seepage prior to ever reaching the service area, and another 8.8 cfs was lost as the canal traversed the service area. Assuming an operation period of 75 days this results in 1,856 acre feet of water. Lining or piping these reaches of canal could save valuable storage water and extend the irrigation season approximately 15 days. The canal is currently lined with concrete below Siphon No. 2 and therefore this section would not qualify for significant funding through the USBR Salinity Control Program. This study focused on the Gould Canal from Gould Reservoir to Siphon No. 2 and evaluated the following options:

- Option 1 – Pressure Pipe from Gould Canal – On Demand System
- Option 2 – Gravity Pipe from Gould Canal
- Option 3 – Shotcrete and Geomembrane Liner
- Option 4 – Rockfilled Geocell and Geomembrane Liner

One primary concern of the FIC is the stability of the two tunnels below Gould Reservoir. These tunnels are mostly unlined and have been slowly eroding over the past 100+ years of service. If one of these tunnels collapsed it would eliminate the ability to deliver water to the main service area after direct diversions have ceased in mid-June. A tunnel specialist, Warren Harrison, P.E., was retained by Applegate to assist with estimating the cost of lining these tunnels with various types of pipe and grouting it in place.

PRESSURE PIPE OPTIONS

RESERVOIR PRESSURE

One option evaluated would involve piping the Gould Canal from Gould Reservoir to the start of Siphon No. 2. This pipeline could be constructed to utilize pressure from the reservoir to pressurize the service area when the reservoir is partially full. The additional head provided by the reservoir would not be able to be utilized to decrease the pipe size, however, due to maximum velocity limitations in pressurized pipelines. Pipelines are typically sized to limit the maximum velocity to 5-6 feet per second.

The existing reservoir outlet conduit consists of 520 feet of 36 inch diameter cast iron pipe installed in 1913. A 150 foot long section of the outlet was lined with 30 inch welded steel pipe in 1989. No inspection of the outlet works was conducted as part of this study; however, due to the age of the infrastructure it is likely that this option would require significant modifications to the outlet in order to allow it to carry pressurized water. New technologies such as Cast-In-Place-Pipe (CIPP) have been used to line aging pipelines, however, the variable pipe size, large diameter, and length of this pipeline would result in a very difficult and expensive project. In addition, this option would require piping a small length of the Highline Canal in order to allow that water to enter the pressurized system. A regulating reservoir would likely be required at the intake of the highline canal in order to balance the variable flow entering the pipeline at that location. This would further increase the cost of such a project while providing little, if any, salinity control benefit/funding. Therefore, this study assumed that sections 1 through 3 of the Gould Canal would operate as gravity flow or low pressure pipelines.

This would preclude a small portion of the system from obtaining pressurized service. The USBR typically defines adequate pressurized service as a minimum of 35 psi at the tap location. Several existing systems under the FIC system successfully use sprinklers with pressures as low as 20 psi. For purposes of this study the limit for pressurized sprinklers was set at 20 psi since that is in line with current practices in the area.

REGULATING RESERVOIR

A regulating reservoir could be constructed near the confluence of the Gould Canal and the Highline Canal which would result in an on demand system below that point which includes the majority of the total shares. Available topography implies that a 15 foot high dam would be required to achieve the necessary water surface elevation. Water would flow into the reservoir from the canal on one side and exit on the other. Based on the assume canal slope in this area of 0.001 feet it is estimated that the top 2.5 feet of the reservoir would function as active storage. With a surface area of approximately 10 acres this would equate to 25 acre feet. Assuming that the demand fluctuates 25% (15 cfs) this reservoir could provide 20 hours of storage. An old dam is located on the Highline Canal above the confluence with the Gould Canal, however, it is full of sediment and no longer used. This would imply that any reservoir constructed in this location would require regular maintenance to avoid losing storage capacity.

PIPELINE

Low pressure or gravity pipe was assumed to be used for sections 1 through 3 of the Gould Canal up to the reservoir. From the regulating reservoir to Siphon 2 it was assumed that fusion welded HDPE would be used due to the large diameter and relatively low pressure requirements (<65 psi)

The pipeline exiting the regulating reservoir could be pressurized to create an on demand system, however, this system would not provide sufficient pressure to approximately 340 acres above Siphon No. 1. Below this point the excess fall available across the siphon could be used to provide approximately 20 psi to taps below Siphon No. 1. This would increase the pressure on the siphon pipe and therefore the structural integrity of the existing siphon would need to be reviewed. As part of this study we attempted to gather construction drawings and specifications associated with the existing siphons, however, we were not successful. The USBR reportedly designed the siphons, but neither they nor FIC was able to locate any information regarding this pipe. If the FIC board decides to pursue this option further work will need to be done to confirm the pipe type and pressure rating. Siphon No. 2 also has a significant amount of fall available, however, additional pressure is not needed and therefore a pressure reducer may be required to control pressures in a pipe system below Siphon No. 2 if that reach of canal was ever piped. Piping the ditch below Siphon No. 2 was not evaluated due to the presence of a concrete liner as discussed previously.

For costing purposes it was assumed that the pipeline would generally follow the existing canal but did allow for some reasonable straightening that would be possible with a pressurized pipeline. Shallow bedrock was observed along the upper bank intermittently along a significant portion of the canal. This shallow rock would be a significant concern for constructing a buried pipeline as the pipe would need to have sufficient cover to protect it from damage. If a piped system is pursued further shallow test pits should be excavated along the canal to determine if this would further increase the cost and further reduce the feasibility of this option.

GRAVITY PIPE OPTIONS

The concern regarding shallow bedrock mentioned above would also apply to a gravity pipe system. The main benefit of a gravity pipe system would be the construction cost. Low pressure or gravity pipe is cheaper than pressure pipe especially in the diameters required for this project. A gravity pipe system could also benefit from the construction of a regulating reservoir but to a lesser degree than the pressurized system due to the location of the reservoir near the upper end of the service area. In a gravity flow system it is more beneficial to have the regulating reservoir lower down in the system where the flows are more variable, however a suitable site was not identified in this study.

While this type of system would not provide users with pressurized service, it would still result in a significant seepage reduction that would preserve additional storage water. As mentioned previously the irrigated lands slope rather steeply away from the main canal. Users under the existing open ditch have been able to pressurize lateral systems to their properties and build sufficient pressure (greater than 20 psi) for sprinkler irrigation. Approximately 300 acres of land below Siphon 1 would not have sufficient pressure if only the laterals were pressurized from a gravity mainline. This brings the total amount of land without pressure to approximately 640 acres, or 12% of the total area. The remaining 88% of the irrigated area could be pressurized by piping the laterals from the gravity mainline.

SHOTCRETE CANAL LINER

Another method that has been used to eliminate seepage on Salinity Control Projects is canal lining. Currently the only acceptable lining methods allowed under the program include a geomembrane

liner with either a shotcrete or soil cover. The cover material primarily serves to protect the liner from damage.

Installation of this type of lining typically starts with preparation of the subgrade to create a uniform trapezoidal section. The Gould Canal is rather shallow compared to its width and therefore a semi-parabolic liner section would likely be easier to grade and install than a trapezoidal section. Based on visual observations during the site visit this study assumes that the canal sections would be graded using on site materials rather than importing fill. In areas with groundwater and drain system has been placed under the liner to prevent the liner from floating. Due to the lack of groundwater on the Gould Canal an underdrain system would not likely be necessary expect in a couple small areas.

The geomembrane liner has typically consisted of three layers of geotextiles. First a non-woven geotextile is placed on the prepared canal bed. Then a 30 mil PVC liner is placed on top and the PVC panels are joined using a heat fusion machine. Another non-woven geotextile is placed on top of the PVC liner. A 3 inch (min) thick layer of shotcrete is then installed on top of the liner. The shotcrete typically contains fibermesh and additional strength is obtained when the shotcrete bonds to the non-woven geotextile. This results in a durable lining method that has been used on other projects for many years. The largest cost item, however, is the shotcrete which only serves to protect the liner.

Soil cover was considered for this project, however, it would likely be more expensive due to the current USBR requirements for soil covered liners. The minimum cover is 15 inches and the material is required to be coarsely graded rock which would require importing the majority of the material. Furthermore, the maximum side slope for this type of liner is 2.5:1 which then requires the side slopes to be laid back significantly. An analysis of this option revealed that using a soil covered liner on this project was not cost effective and would result in a significant increase in the width needed for construction of the liner.

ROCKFILLED-GEOCELL CANAL LINER

Another potential lining method that has not been used on Salinity Control Projects but has been used on channel stabilization projects involves geocells backfilled with rock and or soil. Geocells are made of various materials, however, for purposes of this study it was assumed that HDPE geocells would be used due to their rigidity and durability. It was also assumed that backfill for the geocells would be imported rock material. This would protect the liner from damage resulting from animal traffic and other sources and would produce a stable channel section. This study assumed that a 6 inch high geocell would be used with individual cell sizes of approximately 8 x 10 inches.

One unknown potential issue with this liner is long term maintenance. Over time sediment in the water will likely settle in the rock voids and could allow for vegetation to take root. If that occurs the vegetation may need periodically removed from near the water line. It is possible that in the process of removing the vegetation the rock fill would be removed as well. It is likely that if this method was to be used on any projects a pilot study would need to be conducted. Such a study would need to evaluate various geocell thicknesses, cell sizes, backfill materials, and side slopes.

One key benefit to this method would be that construction could occur during the colder winter months when placing shotcrete is not feasible. On this canal system, however, water deliveries are

typically concluded by mid-August which should leave a sufficient construction window for the placement of shotcrete.

TUNNEL OPTIONS

In order to obtain realistic cost estimates for the lining of the two tunnels, Applegate Group retained Warren Harrison, a tunnel expert to perform the cost evaluation. A previous study performed by URS and survey data of the tunnels by Wilmore and Company were utilized to determine the appropriate pipe size and the amount of grouting necessary to properly protect the pipe. It was determined that in order to carry 60 cfs the pipe would either need to be a 42" HDPE DR 17 pipe or a 42" Corrugated Polypropylene Pipe. Both of these options would require a minor amount of tunnel widening and relocation of a few supports. One section that is currently lined with concrete is only 39" wide. This section is short but would require the pipe size to be reduced. Another option would involve compressing the fusion welded HDPE and inserting internal struts to allow the pipe to be placed through this section. Additional engineering would be necessary to address some of these issues, however, the current analysis is sufficient for this study.

The annulus space between the pipe and tunnel walls would need to be backfilled to further stabilize the tunnels and protect the pipe. The most cost efficient method of achieving this would be to inject cellular concrete through internal grout ports inside the pipeline. Measures would need to be taken to prevent the pipe from floating during grout placement. This study assumed that grout would be placed to a depth of 2 feet above the top of the pipe. This should provide sufficient protection from future rockfall inside the tunnel while reducing the cost of filling the entire tunnel void in areas where the tunnel height exceeds 5.5 feet.

COST EVALUATION

An engineer's opinion of probable cost was prepared for the options discussed above. A summary of the total costs is shown in the table below. These estimates assume that Salinity Control funds will be used at least in part to fund each project; therefore, costs for habitat mitigation, NEPA permitting, and cultural resource studies were included in the estimates.

Section	Pressure Pipe	Gravity Pipe	Shotcrete Liner	Geocell Liner
1&2	n/a	$3,307,024	$1,782,813	$2,066,416
Tunnel 1	$1,251,563	$1,018,257	n/a	n/a
Tunnel 2	$1,951,616	$1,587,812	n/a	n/a
3&4	$5,820,101	$7,063,910	$3,224,511	$3,877,298
5	$3,312,312	$3,858,516	$1,945,667	$2,326,274

FUNDING PLAN

Salt loads for various sections of the Gould Canal were obtained from the USBR in 2015. These numbers are subject to change in future FOA application cycles, however, they are the best available data for use in this study.

Gould Canal Section	Length (ft)	Annual Salt Load (tons/yr)	Salt Load per Foot	Maximum Flowrate (cfs)	Canal Slope (ft/ft)
1&2	17,969	1,266	0.070	60.0	0.0015
Tunnel 1	1,643	119	0.072	60.0	0.0029
Tunnel 2	2,562	186	0.072	60.0	0.0024
3&4	24,960	2,635	0.106	59.6	0.0010
5	18,472	1,847	0.100	66.5	0.0015

The annual salt load for each section was used in conjunction with the engineers opinion of probable cost to calculate the annuitized dollars per ton assuming a 50 year lifespan of each project.

Section	Pressure Pipe	Gravity Pipe	Shotcrete Liner	Geocell Liner
1&2	n/a	108.88	58.69	68.03
Tunnel 1	438.36	356.65	n/a	n/a
Tunnel 2	437.33	355.81	n/a	n/a
3&4	92.06	111.74	51.00	61.33
5	74.75	87.07	43.91	52.50

During the last USBR FOA funding cycle the maximum amount funded was approximately $55 per ton. All of the pipe projects are above this threshold and therefore receiving 100 percent funding for a pipe system through this program is unlikely. The tunnel lining projects, as expected, are far above the amount of funding likely available through the Salinity Control Program. Shotcrete canal lining projects, however, appear to be fundable.

Various project combinations were evaluated to try and determine which projects could be coupled together to result in a fundable project that addresses the tunnel stability issues while providing significant salinity reduction benefits. No project combination is able to provide full funding for the tunnel projects. Any project involving the tunnels would require some amount of money from another source. The most likely source of additional funding at this time is a low interest loan from the CWCB which currently has an interest rate of 1.5 percent and a term of 30 years. Other grants such as the Water Supply Reserve Account, USBR Water Smart program, and others could contribute some funds but not likely to the extent of the Salinity Control Program or a CWCB loan. This project is outside of the boundaries of the RCPP project managed by the Colorado River District and therefore these funds are not available for this project at this time. The RCPP project covers the Crawford Water Conservancy District but does not extend up onto Fruitland Mesa.

The most likely combinations would be those listed in the table below. The amount of additional money required to bring the salinity funding within $55 per ton is also included.

Project Combination	Total Cost	$/Ton	Loan Amount	Annual Pmt
Sec 3&4 Shotcrete with Tunnel 1	$ 4,242,769	$ 55.00	$ 608,652	$ 25,344
Sec 5 Shotcrete with Tunnel 2	$ 3,533,474	$ 55.00	$ 850,776	$ 35,426

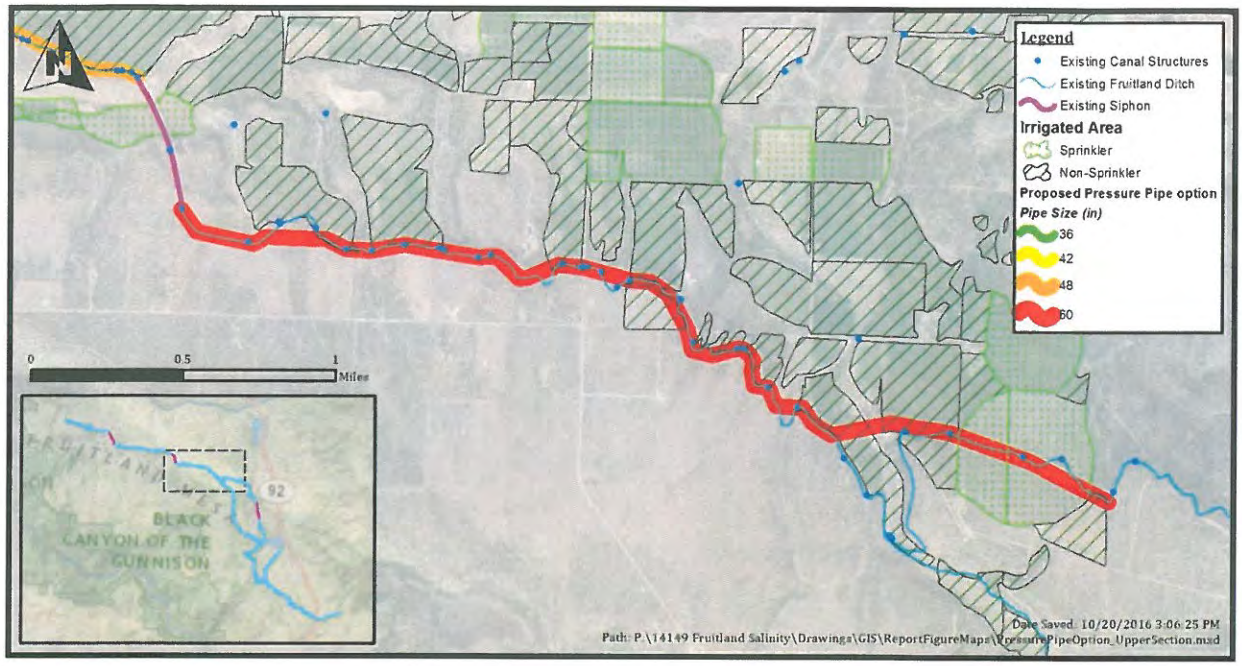
CONCLUSIONS & RECOMMENDATIONS

This study evaluated the feasibility of lining and/or piping the Gould Canal portion of the Fruitland Irrigation Company system. Funding for this type of project is available through the USBR Salinity Control Program. It was concluded that a shotcrete liner system is the most cost efficient method of lining this canal and could potentially receive 100% funding through this program. Lining the open canals without rehabilitating the tunnels, however, leaves the system vulnerable to a tunnel collapse which would be catastrophic for the system as a whole. Therefore, the tunnel projects were combined with some of the liner sections to determine if a combined project could be funded through the Salinity Control Program. This analysis revealed that in order to increase the cost competitiveness of a Salinity Control grant and increase the likelihood of selection, a significant amount of additional money would be needed.

If the FIC decides to proceed with a FOA grant in 2017 we would recommend the following next steps:

- Perform a site visit with Warren Harrison and 1-2 contractors to look at the tunnel sections and adjust the cost estimates for these projects as needed.
- Perform a site visit with a shotcrete contractor and general contractor and adjust the cost estimates as needed
- Perform a cursory survey of the canal slopes to confirm the slopes assumed in this study

Appendix A – Project Figures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Existing Canal Structures
Existing Fruitland Ditch
Existing Siphon
Irrigated Area
Sprinkler
Non-Sprinkler
Proposed Pressure Pipe option
Pipe Size (in)
36
42
48
60
0
0.5
1
Miles
92
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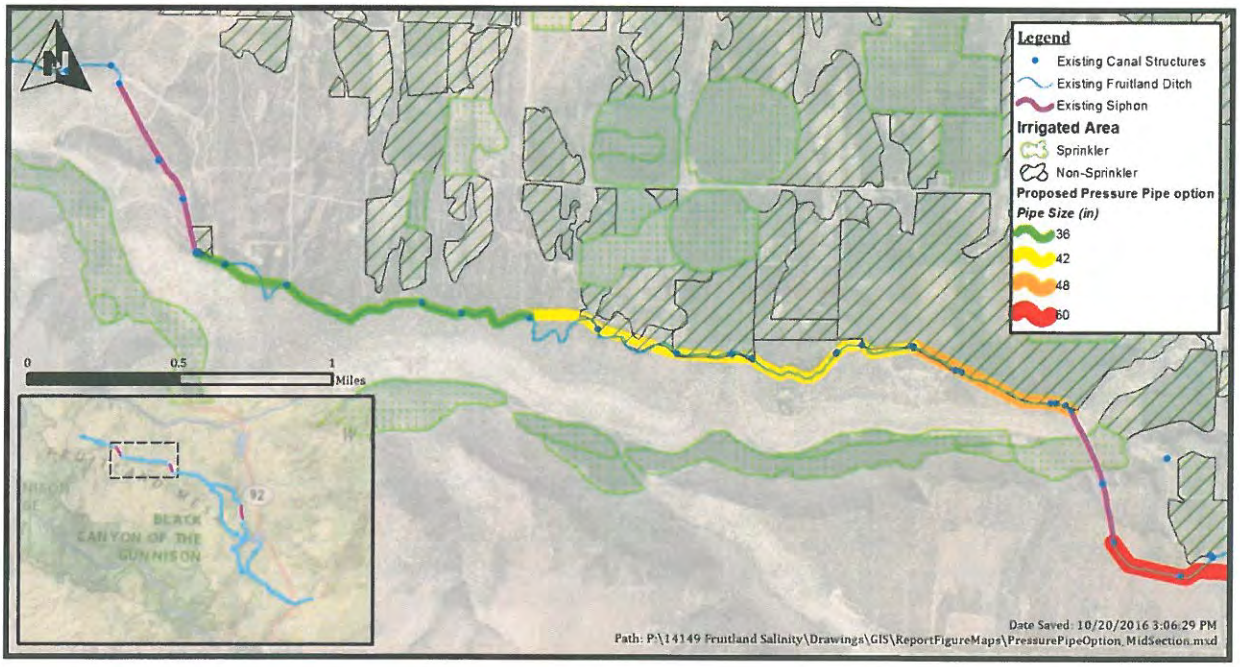
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Existing Fruitland Ditch
Existing Siphon
Irrigated Area
Sprinkler
Non-Sprinkler
Proposed Pressure Pipe option
Pipe Size (in)
36
42
48
60
0
0.5
1
Miles
92
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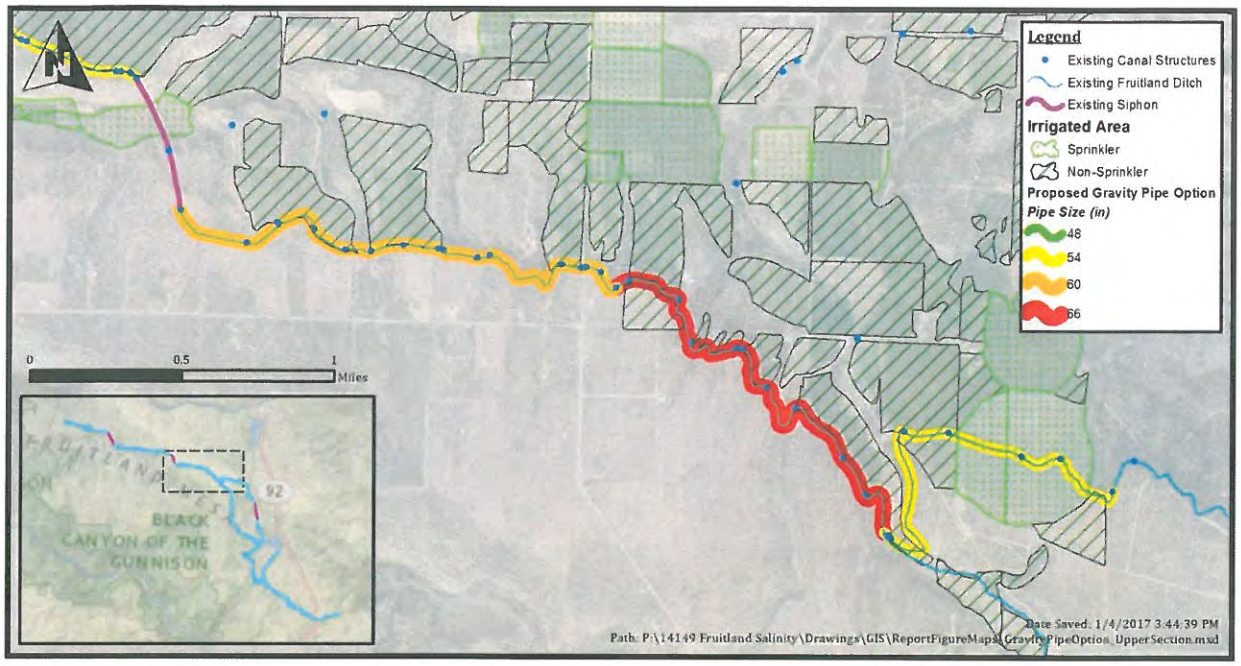
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Existing Fruitland Ditch
Existing Siphon
Irrigated Area
Sprinkler
Non-Sprinkler
Proposed Gravity Pipe Option
Pipe Size (in)
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54
60
66
0
0.5
1
Miles
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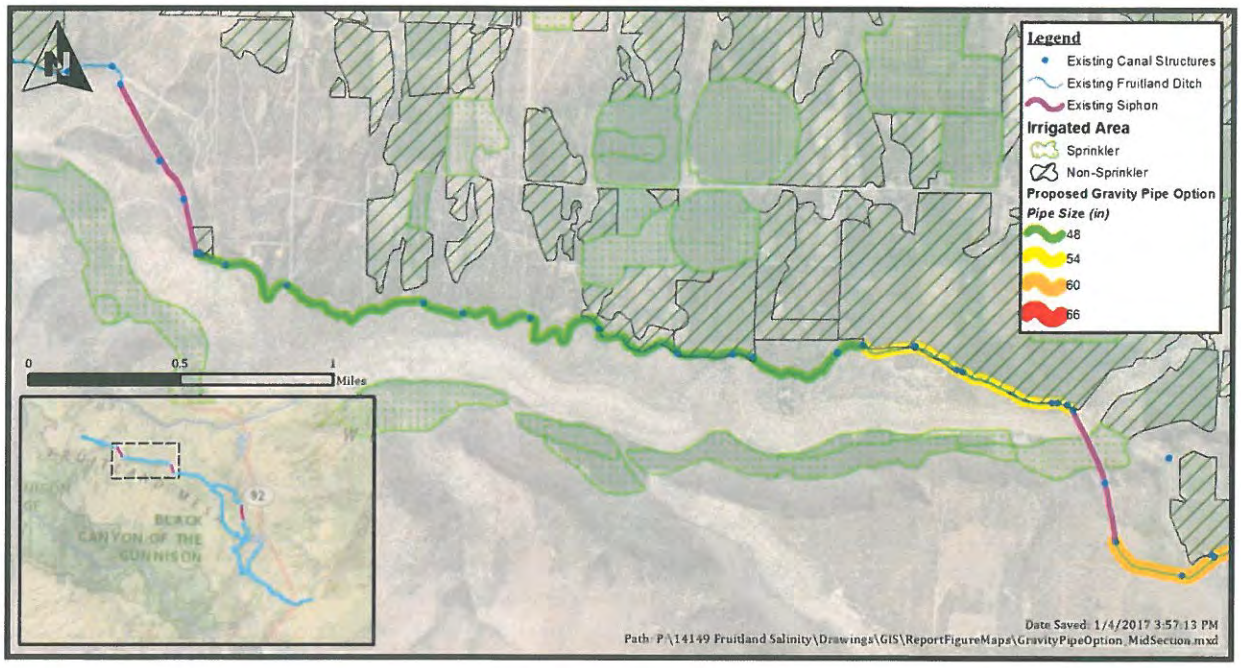
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Existing Fruitland Ditch
Existing Siphon
Irrigated Area
Sprinkler
Non-Sprinkler
Proposed Gravity Pipe Option
Pipe Size (in)
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54
60
66
0
0.5
1
Miles
92
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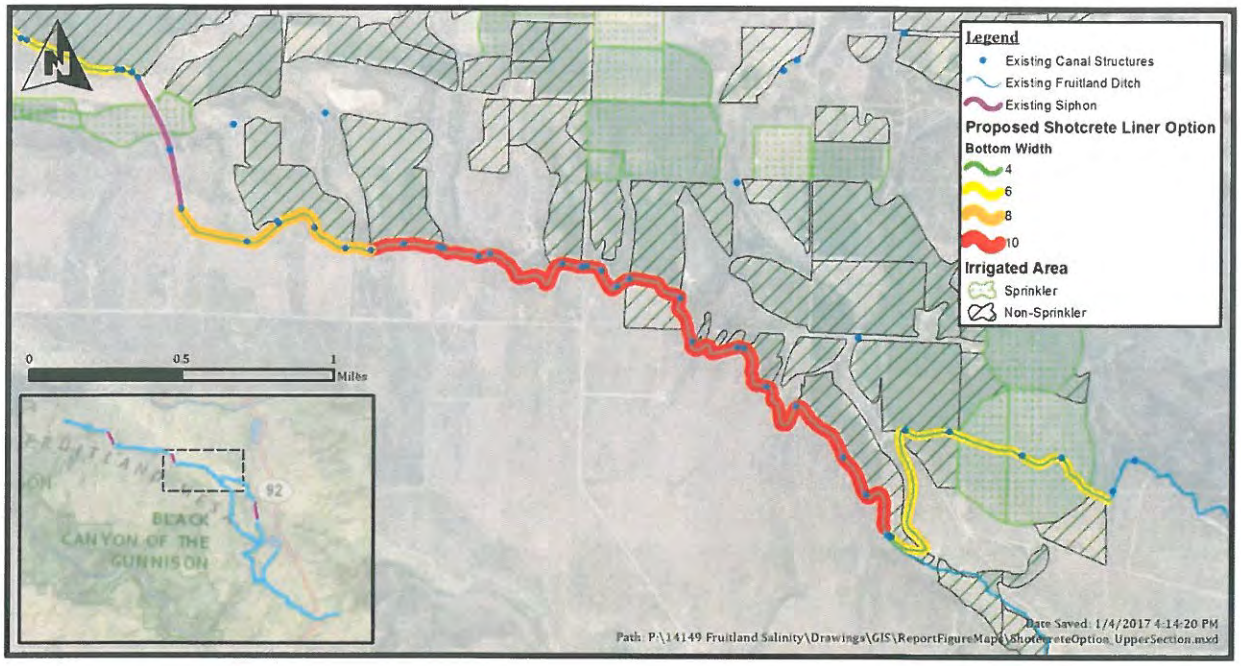
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Existing Fruitland Ditch
Existing Siphon
Proposed Shotcrete Liner Option
Bottom Width
4
6
8
10
Irrigated Area
Sprinkler
Non-Sprinkler
0
0.5
1
Miles
92
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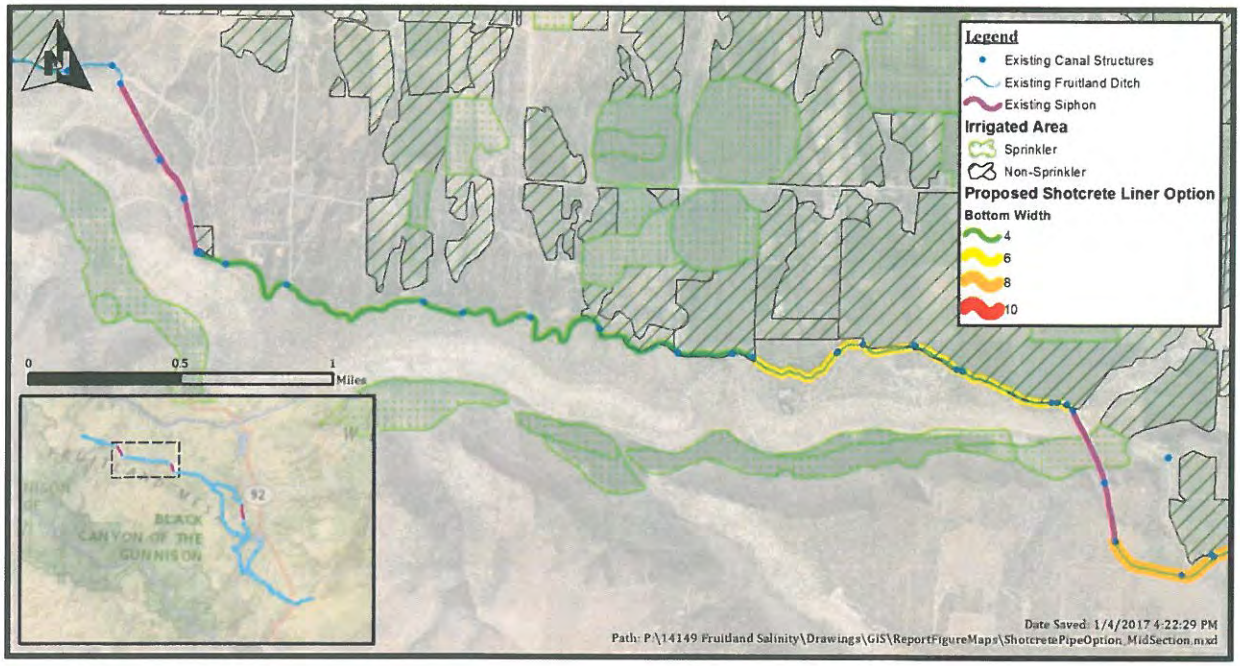
Legend
Existing Canal Structures
Existing Fruitland Ditch
Existing Siphon
Irrigated Area
Sprinkler
Non-Sprinkler
Proposed Shotcrete Liner Option
Bottom Width
4
6
8
10
0
0.5
1
Miles
92
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Appendix B – Cost Estimates

Engineers Opinion of Probable Construction Cost

Pressure Pipe Option

Sections 3 & 4

Item	Units	Quantity	Unit Cost	Total Cost
Mobilization	%		6%	$ 274,251
Clearing, Grubing, & Site Prep Grade	LF	18,650	$ 7.00	$ 130,550
Seeding	LF	18,650	$ 2.00	$ 37,300
63" DR 41 HDPE pipe	LF	18,650	$ 220.00	$ 4,103,000
Turnouts	EA	30	$ 10,000.00	$ 300,000
Regulating Reservoir	LS	1	$ 150,000	$ 150,000
Construction Total				**$ 4,995,101**
Engineering	%		5.0%	$ 250,000
Construction Observation	%		5.0%	$ 250,000
NEPA/Cultural Res	%		1.5%	$ 75,000
Habitat Mitigation	%		5.0%	$ 250,000
Total				**$ 5,820,101**

Engineers Opinion of Probable Construction Cost

Pressure Pipe Option

Section 5

Item	Units	Quantity	Unit Cost	Total Cost
Mobilization	%		6.0%	$ 160,772.40
Clearing, Grubing, & Site Prep Grade	LF	16,710	$ 7.00	$ 116,970
Seeding	LF	16,710	$ 2.00	$ 33,420
36" DR 32.5 HDPE Pipe	LF	6,460	$ 115.00	$ 742,900
42" DR 32.5 HDPE Pipe	LF	7,250	$ 145.00	$ 1,051,250
48" DR 32.5 HDPE Pipe	LF	3,000	$ 175.00	$ 525,000
Turnouts	EA	21	$ 10,000	$ 210,000
Construction Total				**$ 2,840,312**
Engineering	%		5.0%	$ 143,000
Construction Observation	%		5.0%	$ 143,000
NEPA/Cultural Res	%		1.5%	$ 43,000
Habitat Mitigation	%		5.0%	$ 143,000
Total				**$ 3,312,312**

Engineers Opinion of Probable Construction Cost

Gravity Pipe Option

Sections 1 & 2

Item	Units	Quantity	Unit Cost	Total Cost
Mobilization	%		6%	$ 160,642.86
Clearing, Grubing, & Site Prep Grade	LF	17,969	$ 7.00	$ 125,783
Seeding	LF	17,969	$ 2.00	$ 35,938
48" HP Storm Pipe	LF	17,969	$ 140	$ 2,515,660
Construction Total				**$ 2,838,024**
Engineering	%		5%	$ 142,000
Construction Observation	%		5%	$ 142,000
NEPA/Cultural Res	%		1.5%	$ 43,000
Habitat Mitigation	%		5%	$ 142,000
Total				**$ 3,307,024**

Engineers Opinion of Probable Construction Cost

Gravity Pipe Option

Sections 3 & 4

Item	Units	Quantity	Unit Cost	Total Cost
Mobilization	%		6%	$ 343,070.40
Clearing, Grubing, & Site Prep Grade	LF	24,960	$ 7.00	$ 174,720
Seeding	LF	24,960	$ 2.00	$ 49,920
54" Gravity Pipe	LF	7,380	$ 160	$ 1,180,800
60" HP Storm Pipe	LF	9,100	$ 180	$ 1,638,000
66" Pipe	LF	8480	$ 280	$ 2,374,400
Turnouts	EA	30	$ 10,000	$ 300,000
Construction Total				**$ 6,060,910**
Engineering	%		5%	$ 304,000
Construction Observation	%		5%	$ 304,000
NEPA/Cultural Res	%		1.5%	$ 91,000
Habitat Mitigation	%		5%	$ 304,000
Total				**$ 7,063,910**

Engineers Opinion of Probable Construction Cost

Gravity Pipe Option

Section 5

Item	Units	Quantity	Unit Cost	Total Cost
Mobilization	%		6%	$ 187,387.68
Clearing, Grubing, & Site Prep Grade	LF	18,472	$ 7.00	$ 129,304
Seeding	LF	18,472	$ 2.00	$ 36,944
48" HP Storm Pipe	LF	14,452	$ 140	$ 2,023,280
60" HP Storm Pipe	LF	4,020	$ 180	$ 723,600
Turnouts	EA	21	$ 10,000	$ 210,000
Construction Total				**$ 3,310,516**
Engineering	%		5.0%	$ 166,000
Construction Observation	%		5.0%	$ 166,000
NEPA/Cultural Res	%		1.5%	$ 50,000
Habitat Mitigation	%		5.0%	$ 166,000
Total				**$ 3,858,516**

Engineers Opinion of Probable Construction Cost

Shotcrete Lining Option

Sections 1 & 2

Item	Units	Quantity	Unit Cost	Total Cost
Mobilization	%		6%	$ 87,000
Seeding	LF	17,969	$ 2.00	$ 35,938
6ft Bottom Width - Canal Prep	LF	17,969	$ 11.25	$ 202,151
6ft Bottom Width - Shotcrete	CY	2,496	$ 325.00	$ 811,101
6ft Bottom Width - Liner	SF	341,411	$ 1.15	$ 392,623
Construction Total				**$ 1,528,813**
Engineering	%		5%	$ 77,000
Construction Observation	%		5%	$ 77,000
NEPA/Cultural Res	%		1.5%	$ 23,000
Habitat Mitigation	%		5%	$ 77,000
Total				**$ 1,782,813**

Engineers Opinion of Probable Construction Cost

Shotcrete Lining Option

Sections 3 & 4

Item	Units	Quantity	Unit Cost	Total Cost
Mobilization	%		6%	$ 157,000
Seeding	LF	24,960	$ 2.00	$ 49,920
6ft Bottom Width - Canal Prep	LF	7,380	$ 11.25	$ 83,025
6ft Bottom Width - Shotcrete	CY	1,025	$ 325.00	$ 333,125
6ft Bottom Width - Liner	SF	140,220	$ 1.15	$ 161,253
8ft Bottom Width - Canal Prep	LF	4,020	$ 12.75	$ 51,255
8ft Bottom Width - Shotcrete	CY	633	$ 325.00	$ 205,653
8ft Bottom Width - Liner	SF	84,420	$ 1.15	$ 97,083
10ft Bottom Width - Canal Prep	LF	13,560	$ 14.25	$ 193,230
10ft Bottom Width - Shotcrete	CY	2,386	$ 325.00	$ 775,306
10ft Bottom Width - Liner	SF	311880	$ 1.15	$ 358,662
Turnouts	EA	30	$ 10,000	$ 300,000
Construction Total				**$ 2,765,511**
Engineering	%		5%	$ 139,000
Construction Observation	%		5%	$ 139,000
NEPA/Cultural Res	%		1.5%	$ 42,000
Habitat Mitigation	%		5%	$ 139,000
Total				**$ 3,224,511**

Engineers Opinion of Probable Construction Cost

Shotcrete Lining Option

Section 5

Item	Units	Quantity	Unit Cost	Total Cost
Mobilization	%		6%	$ 95,000
Seeding	LF	18,472	$ 2.00	$ 36,944
4ft Bottom Width - Canal Prep	LF	12,172	$ 9.75	$ 118,677
4ft Bottom Width - Shotcrete	CY	1,465	$ 325.00	$ 476,173
4ft Bottom Width - Liner	SF	206,924	$ 1.15	$ 237,963
6ft Bottom Width - Canal Prep	LF	6,300	$ 11.25	$ 70,875
6ft Bottom Width - Shotcrete	CY	875	$ 325.00	$ 284,375
6ft Bottom Width - Liner	SF	119,700	$ 1.15	$ 137,655
Turnouts	EA	21	$ 10,000	$ 210,000
Construction Total				**$ 1,667,662**
Engineering	%		5%	$ 84,000
Construction Observation	%		5%	$ 84,000
NEPA/Cultural Res	%		1.5%	$ 26,000
Habitat Mitigation	%		5%	$ 84,000
Total				**$ 1,945,662**

Engineers Opinion of Probable Construction Cost

Geocell Lining Option

Sections 1 & 2

Item	Units	Quantity	Unit Cost	Total Cost
Mobilization	%		6%	$ 101,000
Seeding	LF	17,969	$ 2.00	$ 35,938
6ft Bottom Width - Canal Prep	LF	17,969	$ 11.25	$ 202,151
6ft Bottom Width - Rockfilled Geocell Cover	CY	4,991	$ 208.50	$ 1,040,705
6ft Bottom Width - Liner	SF	341,411	$ 1.15	$ 392,623
Construction Total				**$ 1,772,416**
Engineering	%		5%	$ 89,000
Construction Observation	%		5%	$ 89,000
NEPA/Cultural Res	%		1.5%	$ 27,000
Habitat Mitigation	%		5%	$ 89,000
Total				**$ 2,066,416**

Engineers Opinion of Probable Construction Cost

Geocell Lining Option

Sections 3 & 4

Item	Units	Quantity	Unit Cost	Total Cost
Mobilization	%		6%	$ 189,000
Seeding	LF	24,960	$ 2.00	$ 49,920
6ft Bottom Width - Canal Prep	LF	7,380	$ 11.25	$ 83,025
6ft Bottom Width - Rockfilled Geocell Cover	CY	2,050	$ 208.50	$ 427,425
6ft Bottom Width - Liner	SF	140,220	$ 1.15	$ 161,253
8ft Bottom Width - Canal Prep	LF	4,020	$ 12.75	$ 51,255
8ft Bottom Width - Rockfilled Geocell Cover	CY	1,563	$ 208.50	$ 325,955
8ft Bottom Width - Liner	SF	84,420	$ 1.15	$ 97,083
10ft Bottom Width - Canal Prep	LF	13,560	$ 14.25	$ 193,230
10ft Bottom Width - Rockfilled Geocell Cover	CY	5,273	$ 208.50	$ 1,099,490
10ft Bottom Width - Liner	SF	311880	$ 1.15	$ 358,662
Turnouts	EA	29	$ 10,000	$ 290,000
Construction Total				**$ 3,326,298**
Engineering	%		5%	$ 167,000
Construction Observation	%		5%	$ 167,000
NEPA/Cultural Res	%		1.5%	$ 50,000
Habitat Mitigation	%		5%	$ 167,000
Total				**$ 3,877,298**

Engineers Opinion of Probable Construction Cost

Geocell Lining Option

Section 5

Item	Units	Quantity	Unit Cost	Total Cost
Mobilization	%		6%	$ 113,000
Seeding	LF	18,472	$ 2.00	$ 36,944
4ft Bottom Width - Canal Prep	LF	12,172	$ 9.75	$ 118,677
4ft Bottom Width - Rockfilled Geocell	CY	3,832	$ 208.50	$ 798,957
4ft Bottom Width - Liner	SF	158,236	$ 1.15	$ 181,971
6ft Bottom Width - Canal Prep	LF	6,300	$ 11.25	$ 70,875
6ft Bottom Width - Rockfilled Geocell	CY	2,217	$ 208.50	$ 462,175
6ft Bottom Width - Liner	SF	94,500	$ 1.15	$ 108,675
Turnouts	EA	21	$ 5,000	$ 105,000
Construction Total				**$ 1,996,274**
Engineering	%		5%	$ 100,000
Construction Observation	%		5%	$ 100,000
NEPA/Cultural Res	%		1.5%	$ 30,000
Habitat Mitigation	%		5%	$ 100,000
Total				**$ 2,326,274**

Engineers Opinion of Probable Construction Cost

Upper Tunnel

Gravity Pipe

Item	Units	Quantity	Unit Cost	Total Cost
Const Cost From Warren Harrison 42" HP Storm	LF	1643	$ 523.00	$ 859,289
Engineering	%		7%	$ 60,150.23
Construction Observation	%		5%	$ 42,964.45
NEPA/Cultural Res	%		1.5%	$ 12,889.34
Habitat Mitigation	%		5%	$ 42,964.45
Total				**$ 1,018,257**

salt load		119
factor		0.04168
$/ton	$	356.65

Engineers Opinion of Probable Construction Cost

Upper Tunnel

Pressure Pipe

Item	Units	Quantity	Unit Cost	Total Cost
Const Cost From Warren Harrison 42" HDPE DR17	LF	1643	$ 665.00	$ 1,092,595
Engineering	%		7%	$ 60,150.23
Construction Observation	%		5%	$ 42,964.45
NEPA/Cultural Res	%		1.5%	$ 12,889.34
Habitat Mitigation	%		5%	$ 42,964.45
Total				**$ 1,251,563**

salt load		119
factor		0.04168
$/ton	$	438.36

Engineers Opinion of Probable Construction Cost

Lower Tunnel

Gravity Pipe

Item	Units	Quantity	Unit Cost	Total Cost
Const Cost From Warren Harrison	LF	2562	$ 523.00	$ 1,339,926
Engineering	%		7%	$ 93,794.82
Construction Observation	%		5%	$ 66,996.30
NEPA/Cultural Res	%		1.5%	$ 20,098.89
Habitat Mitigation	%		5%	$ 66,996.30
Total				**$ 1,587,812**

salt load		186
factor		0.04168
$/ton	$	355.81

Engineers Opinion of Probable Construction Cost

Lower Tunnel

Pressure Pipe

Item	Units	Quantity	Unit Cost	Total Cost
Const Cost From Warren Harrison	LF	2562	$ 665.00	$ 1,703,730
Engineering	%		7%	$ 93,794.82
Construction Observation	%		5%	$ 66,996.30
NEPA/Cultural Res	%		1.5%	$ 20,098.89
Habitat Mitigation	%		5%	$ 66,996.30
Total				**$ 1,951,616**

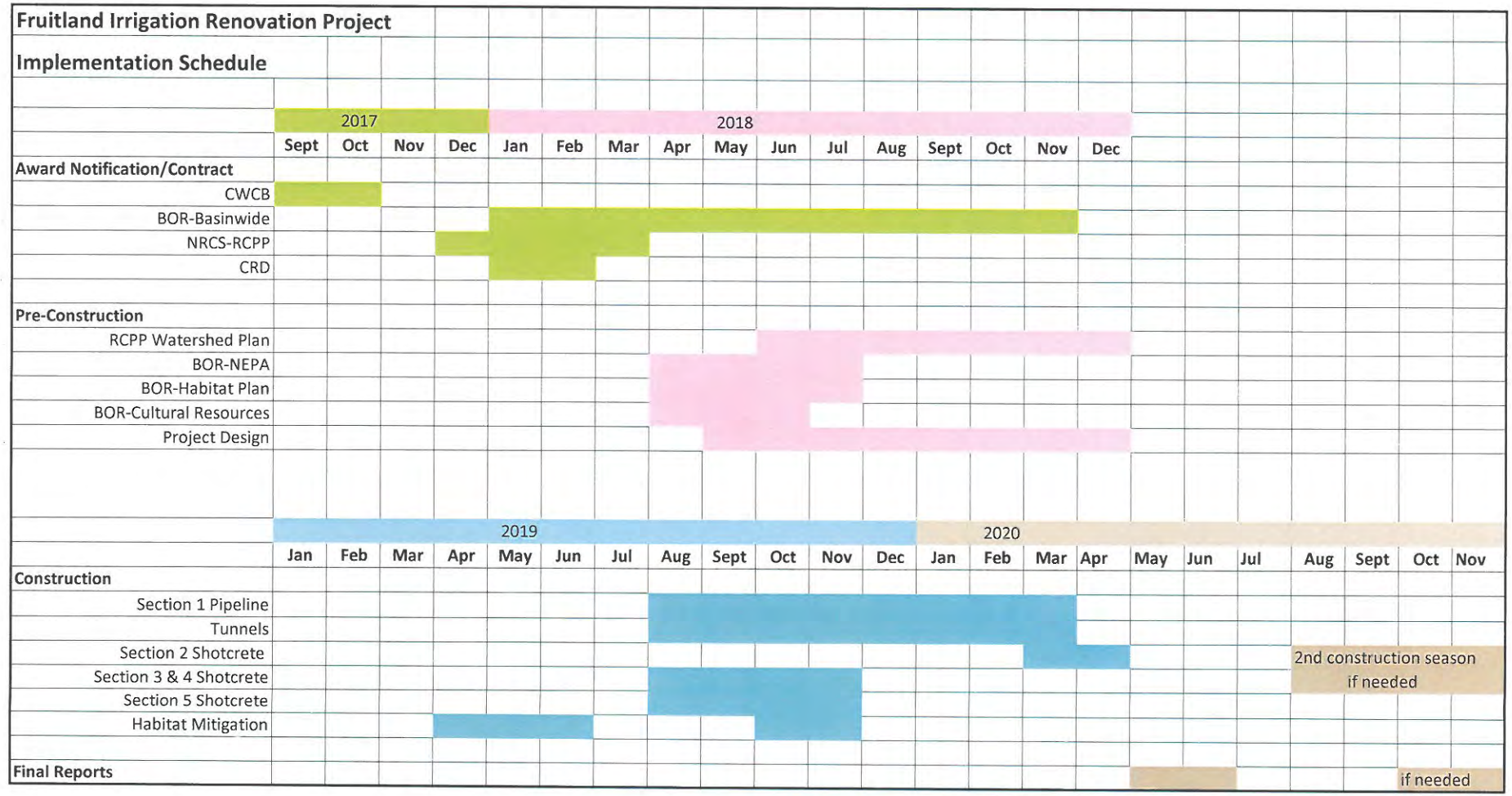
salt load		186
factor		0.04168
$/ton	$	437.33

Appendix D

Project Implementation Schedule

Fruitland Irrigation Renovation Project

Implementation Schedule



Appendix E

CWCB Loan Application

COLORADO
Colorado Water Conservation Board
Department of Natural Resources

Water Project Loan Program

Application Type

☐ Prequalification *(Attach 3 years of financial statements)* ☑ Loan Approval *(Attach Loan Feasibility Study)*

Agency/Company Information

Company / Borrower Name: Fruitland Irrigation Company

Authorized Agent &Title: Danny Todd, Board President

Address: 34918 Fruitland Mesa Rd, Crawford, CO 81415

Phone: (970) 921-7051 | Email: toddcattlecompany@gmail.com

Organization Type: ☑ Ditch Co, ☐ District, ☐ Municipality ☐ other: _____ | Incorporated? ☑ YES ☐ NO

County: Montrose | Number of Shares/Taps: 200,000

Water District: 40 | Avg. Water Diverted/Yr 10,103 acre-feet

Number of Shareholders/Customers Served: 130 | Current Assessment per Share $ 0.50 (Ditch Co)

Federal ID Number: 84-0207921 | Average monthly water bill $ _____ (Municipality)

Contact Information

Project Representative: Danny Todd, Board President

Phone: (970) 589-5230 | Email: toddcattlecompany@gmail.com

Engineer: Craig Ullmann, Applegate Group Inc.

Phone: (970) 631-3675 | Email: craigullmann@applegategroup.com

Attorney: Accountant: Randy Fisher, North Fork Accounting

Phone: (970) 872-3664 | Email: northforkrandy@gmail.com

Project Information

Project Name: Fruitland Irrigation Tunnel & Canal Renovation Project

Brief Description of Project: (Attach separate sheets if needed)

This project proposes to stabilize and pipe two rock tunnels (1643' + 2562') that are in danger of collapse, pipe another 6744' of open ditch, and shotcrete line an additional 10.3 miles of open, earthen canal. These improvements will enable the Fruitland Irrigation Company to continue reliable irrigation water delivery to over 5000 acres, reduce losses and extend the irrigation season by 2 weeks, and reduce salinity contributions to the CO River.

General Location: (Attach Map of Area)

Other Costs: NEPA, Cultural Resources Survey, Wildlife Habitat Mitigation, Project Management

Estimated Engineering Costs: $ 909,114 | Estimated Construction Costs: $ 8,651,297

Other Costs (Describe Above): $ 602,334 | Estimated Total Project Costs: $ 10,162,746

Requested Loan Amount: $ 1,721,400 | Requested Loan Term (10, 20, or 30 years): 40 Years

Project Start Date(s) Design: January 2018 Construction: September 2018

Signature

Danny Todd 5/25/2017

Signature / Title Date

Return to: Finance Section Attn: Anna Mauss
1313 Sherman St #718
Denver, CO 80203
Ph. 303/866.3449
e-mail: anna.mauss@state.co.us

Appendix F

Financial Statements

Additional Materials

URS, Inc.

Video of Fruitland Irrigation Tunnel Survey

June 2009