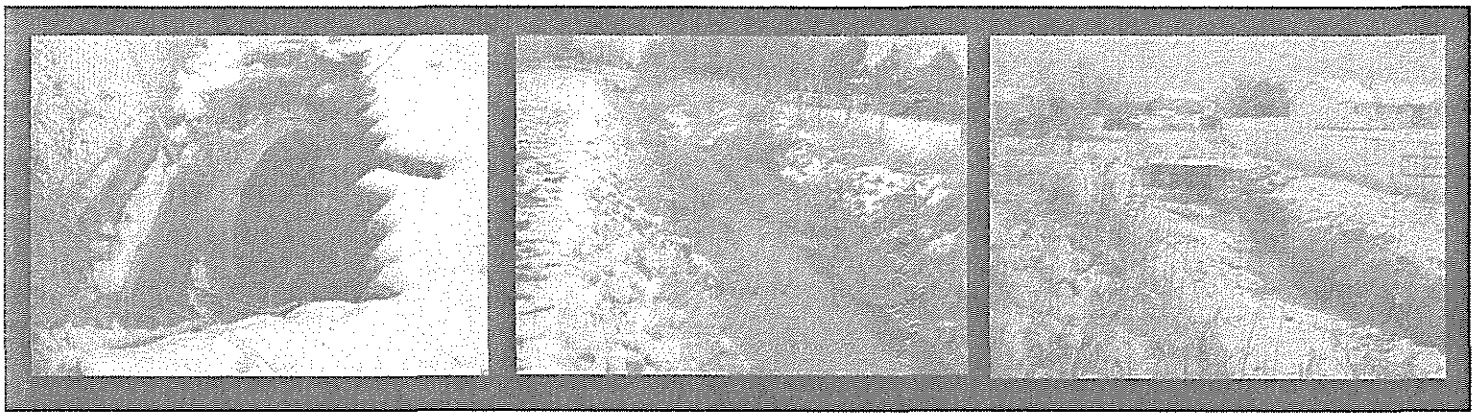


Davis & Weber Counties Canal Company Piping and Hydro Project

WaterSMART: Water & Energy Efficiency Grants for FY 2015

Project Manager:
Bryce Wilcox
Email BKW@jub.com

Address
466 N 900 W
Kaysville, UT 84037

p. 801-547-0393
f. 801-547-0397

Table of Contents

Attachments

A – Geographic & Project Location Map
B – Canal Enclosure Location Map
C – Hydropower Project Location Map
D – Product Technical Support
E – SOR Hydro Feasibility
F – Planning Documents

Executive Summary

Applicant Info

Date, Applicant Name, City, County and State

Date: January 8, 2015

Applicant name: Davis and Weber Counties Canal Company (DWCCC)

City, County, State: Sunset, Davis, Utah

Project Manager:

- Name: Bryce Wilcox, P.E. DWCCC Engineer
- Title: Project Manger
- Telephone: 801-547-0393
- E-mail: bkw@jub.com

Project Funding Request: $300,000.00 total project costs $750,478.00

Project Summary

A one paragraph project summary that specifies the work proposed, including how project funds will be used to accomplish specific project activities and briefly identifies how the proposed project contributes to accomplishing the goals of this FOA

The project is being requested under Funding Group I and has been identified within the System Optimization Review (SOR) which was approved in 2013. This project will result in better management of 5,255 acre-feet of water which flows through the project area of the lower main canal, the conservation of 365 acre-feet of water and power generation of 43,200 kWh of renewable energy that can be used by the Canal Company to run their main diversion structure and the remaining power sold to Rocky Mountain Power for renewable energy benefits.

The project consists of piping 2,000 feet of open, unlined earthen canal 66-inch reinforced concrete pipe (RCP) to reduce seepage, conserve water, and better manage water distribution. Along with this, a 10kW Small hydro power generation turbine, will be located on the main canal allowing the Company to generate 43,200 kilowatt hours (kWh) of power per year. The DWCCC project is a positive step toward achieving the goals of the WaterSMART program by implementing methods and materials that have proven successful for water conservation and energy sustainability.

This project falls under Task A – Water Conservation Canal Lining/Piping and Irrigation Flow Measurement and Task B – Energy-Water Nexus for Implementing Renewable Energy Projects Related to Water Management and Delivery.

Schedule

State the length of time and estimated completion date for the project

This project is ready to move forward as soon as it is awarded. In the fall of 2014 D&W prepared an environmental assessment document that included the entire main canal – which is where this project is located. The environmental document is on schedule to be submitted to the Reclamation by the end of January 2015. With the approval of this document all of the environmental compliance required for this project will be completed. Therefore no environmental cost or time will be included in this application.

The permits for the small hydro power have been filed under a "Conduit Exemption" for small hydro and the power sales agreement has been applied for as part of another project that DWCCC is constructing. It is anticipated that these will be approved within the next three months.

The preliminary master planning for the piping component of the project and a hydraulic analysis of the hydro portion have both been completed as part of an approved System Optimization Review (SOR). The project is ready to prepare the final design as soon as the contracts are signed. Final design will take an estimated one to three months. The piping portion of the project will take three to five months and will need to take place outside of the irrigation season (April 15- October 15th). It is anticipated that the actual construction of the project will take place in the October 2015 – March 2016 timeframe however it may be necessary, because of the irrigation season, to complete the project after the irrigation season October 2016 – March 2017. The project will be accomplished within the two year allowance.

Background Data

Geographic Location/Map

The service area of DWCCC includes communities located in Weber, Davis, Summit, and Morgan Counties, including the cities of West Point, Clinton, Sunset, Layton, South Weber, Kaysville, Roy, Clearfield, West Haven, Riverdale, and Syracuse with a total population of over 370,000 residents. They also provide water to the Snyderville Basin Area, South Weber, Roy, Clinton, West Point, Syracuse, Layton, and Kaysville for irrigation and secondary water use. The project location is shown within an overview of the entire service area and is indicated in Attachment A, Geographic and Project Location Map.

Water Supply

Describe the source of water supply, the water rights involved, current water uses (i.e., agricultural, municipal, domestic, or industrial), the number of water users served, and the current and projected water demand. Also, identify potential shortfalls in water supply. If water is primarily used for irrigation, describe major crops and total acres served.

» ***Source of water supply:*** The source of water is from the direct flow rights of the Weber River, which is supplied from reservoir storage in Echo and East Canyon Reservoirs. Water is delivered through a series of canals, ditches, and low- and high-pressure pipelines from the main canal.

» ***Water rights involved:*** Direct flow water rights claimed, using the Weber River based upon the flow of the river for direct use:

- Flood 433 cfs,
- High Water 216 cfs
- Low Water 133 cfs
- Storage rights of 57,553 acre-feet (28,000 from East Canyon Reservoir and 29,553 from Echo Reservoir)
- The 6-year average annual water rights available is 70,240 acre feet. The average annual use delivered through the canal system is 55,036 acre-feet. The remaining portion (15,204 acre-feet) is directly diverted from the Weber River by other shareholders.

» ***Current water uses and number of water users served:*** The majority of the water use (based on volume) is agricultural with over 40,790 acres irrigated. Secondary water uses for lawns and garden, parks, churches, and schools consists of over 31,439 connections within the DWCCC service area including

water supplied to the sub-districts of Roy, South Weber, Syracuse, and Weber Basin Water Conservancy District.

» ***Current and projected water demand:*** Current demands are for more than 70,000 acre-feet of water. The Company has seen major changes in safety requirements and laws regarding water use and water rights. Local laws and policy changes, terrorist threats, and natural disasters, including potentials for residential property flooding have reminded the Canal Company of the external risks and demands placed upon them and their water supply. Through extensive planning and evaluation, a list of potential water demands includes the following:

- Water to serve an additional 10,000 secondary water connections within the next ten years as growth and land use conversions continue throughout the DWCCC service area.
- Additional water to meet municipal and industrial (M&I) demands as communities and commercial areas continue to evolve and grow. Information from the 2010 census indicates that the DWCCC service area, which includes areas within Weber and Davis Counties, doubled in population in 10 years instead of 20 years as earlier projected. The Company also supplies water to areas within Morgan and Summit Counties. They have also experienced significant and intense growth according to the 2010 census. This population change has prompted DWCCC to plan and prepare for greater secondary water needs beyond what had been originally anticipated.
- Water to service the fast growing Summit County area. The Summit Water Distribution District has 303 shares of DWCCC water and Weber Basin Water Conservancy District is currently leasing 5,000 acre-feet of water for the Park City/Snyderville Basin areas. Their thirst for water is growing at staggering rates and will be a significant impact for demands upon available existing DWCCC water supplies.

Residential Areas Adjacent to Canal

» ***Potential shortfalls in water supply:*** DWCCC faces potential shortfalls in four main areas:

1. The principal potential shortfall for the Canal Company is water losses that could cause potential flooding to residents through the main canal. These losses have impacted water delivery in past drought years which has caused considerable shortages. The past two years (2012-14) have been considered to be drought years and 2015 is not looking any better. With the amount of water losses in the system, many users downstream have been impacted. Water seepage and losses within this project area are estimated to be at least 365 acre-feet of water annually and possibly more. Visual inspections show water seeping from the canal into the adjacent farm land and residential backyards because of the extremely deteriorated condition of the canal. The project within this application is considered to be a high priority.

The project area of the canal for consideration is unlined. Water is seeping through the canal embankment into fields, residential backyards, schools, and businesses in areas that are lower in elevation than the canal. The seeping water erodes the fine soils. If enough soil material is lost, voids will occur and potentially breach the canal. Soils with voids are also an invitation for rodents and other small mammals to set up housekeeping. A potential breach in this area would be devastating! Homes, water users, municipalities, and farmers would lose their water supply and become significantly impacted with property damage and loss of crop production. This would also place more demands on municipal water supplies beyond their capacities to deliver.

Echo Reservoir Aug 2012 only 40% capacity

2. Drought - DWCCC potential shortfalls from drought can and have had an impact on the current water supply. The State of Utah does not have a detailed drought management plan, but has made strides since the severe drought of the late 1990's and early 2000 years. However, extreme concerns exist in the DWCCC service area which caused them to redefine their drought mitigation plans and implementations on an annual basis. In 2012, 2013, and 2014, the snowpack was minimal at best which supplies reservoir storage. The Canal Company was forced to start using their storage water much earlier than normal. The irrigation season was cut short by 14 days in 2013 and 2014 and in 2012 the Company received only 40 days of natural flow from the Weber River for the season. This required the company to request all users to limit their water usage

very early in the season and throughout the year. The droughts have severely impacted the amount of storage carryover water available at the end of the irrigation season. It looks like the area could be in a drought situation again this year (2015). If the natural flow rights are not available, the Company may not be able to provide enough water to its users. The transmission losses on the lower main canal will complicate the already severe water shortages. The water losses from seepage, potential flooding and drought conditions make this a high priority project in 2015-2016 on the lower main canal.

The Canal Company evaluates its drought situations and operational procedures each year including its management decisions for existing conditions. DWCCC gathers data and identifies potential areas of concerns by monitoring flow rates at various locations on a regular basis, which includes correlation with other entities. The amount of water available for delivery each year comes from natural flow rights and storage rights.

3. The Bureau of Reclamation did modification work on Echo Reservoir. From June 2011 thru August 2014, extensive modifications on Echo Reservoir, Dam, and Spillway were completed as part of the Safety of Dams (SOD) program. During this work, the Reservoir was required to be kept to less than half full on average of its capacity throughout the years of construction. The Company's storage right was reduced similarly by 50% to 90%. This past year the Company felt the impacts from the reduced storage amounts, because of the SOD and drought conditions, and water seepage losses.

Work on the Echo Dam 2012

4. Growth - Within the past 10 years, DWCCC's service area has seen a significant population increases with many new residential housing developments, businesses, schools, and churches; some of which border next to the main canals' trunk line. Davis and Weber Counties are listed as two of the fastest growing counties in Utah. Both of these counties are served by DWCCC water. Further evidence of growth is shown in the conversion of water used for agriculture purposes to that of residential lawn and garden uses. In 1995,

agricultural water usage was 80% of the total water used, whereas today the use is approximately 55% according to the Governor of Utah Water Task Force Committee. This 25% difference is water that has been converted from agriculture crop production to outdoor agriculture uses for lawns gardens, parks, schools and churches, municipal and commercial needs. As the population increases in the service area, the need for more culinary and secondary water also increases. This demand could have significant impacts on the Company's ability to provide water to other new customer needs in their service areas which are running short of water based upon drought conditions, insufficient storage, and transmission water losses from unlined or unenclosed distribution systems.

Water Delivery System

Describe the applicant's water delivery system as appropriate. For agricultural systems, please include the miles of canals, miles of laterals, and existing irrigation improvements (i.e., type, miles, and acres). For municipal systems, please include the number of connections and/or number of water users served and any other relevant information describing the system.

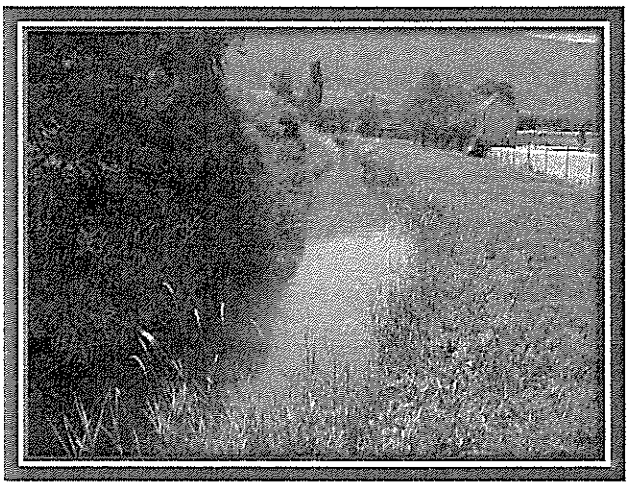
Reservoirs

- East Canyon Reservoir storage 48,000 acre-feet capacity (DWCCC owns 28,000 acre-feet of this capacity)
- Echo Reservoir storage 74,000 acre-feet capacity (DWCCC owns 40% of this capacity)

Canal System

(See Attachment A for a map of the main canal system) The headworks river control gates and overflow gates divert water from the Weber River into the DWCCC canal.

- Forebay channel includes trash racks, a canal gate, which controls the flow into the main canal, and an overflow crest gate structure that diverts excess water back into the Weber River which helps for control of deliveries as well as, fish flow protection.



Section of Open Canal in Project Area

- The DWCCC canal system consists of 17.22 miles of main canal which is defined as the upper main canal and the lower main canal:
  - » Open Channel – 12.3 miles of trapezoidal concrete-lined channel
  - » Enclosed – 4.9 miles of pipe or box culvert

» 90 diversion gates and syphons servicing 100 different ditch companies

Pressurized Secondary System

- Approximately 36 miles of pressurized secondary water transmission trunk lines
- Sunset Secondary Water Reservoir with 34 acre-feet capacity
- Church Street Secondary Water Reservoir with 43 acre-feet water storage capacity
- Kaysville East Secondary Water Reservoir with 24 acre-feet water storage capacity
- 200 South West Point Secondary Water Reservoir with 12 acre-feet water storage capacity
- Roy Water Conservancy Sub-District with a 125 acre-feet water storage capacity
- 112.4 miles of secondary water distribution piping in the West Point/Clinton System
- 64.8 miles of pressurized secondary water distribution piping in the Kaysville/Layton System
- 3.2 miles of pressurized secondary water distribution piping in South Weber System
- Syracuse Sub-District with three water storage reservoirs that total 106 acre-feet water storage capacity

Energy Efficiency

If the application includes renewable energy or energy efficiency elements, describe existing energy sources and current energy uses.

This project will have renewable energy components of the project by installing one 10kWh small hydro power generation turbine. Currently, within another project DWCCC is implementing this same type of renewable energy component in its system. With the development of this new project additional hydro power generation will give DWCCC a greater renewably energy opportunity within their system which will allow them to reduce their reliance on outside sources and permit the company to run many of their own facilities with this power that has been generated.

Relationship with Reclamation

Identify any past working relationships with Reclamation. This should include the date(s), description of prior relationships with Reclamation, and a description of the projects(s).

DWCCC has had a number of projects in conjunction with Reclamation over the past years, starting in the 1930s with the construction of Echo Dam and in 1964 expansion of the of the East Canyon Dam. Reclamation facilities exist in the same Weber River Basin as this proposed project. Some DWCCC stock is owned by Weber Basin Water Conservancy District (WBWCD) a reclamation project. Some of their water is delivered through the DWCCC facilities, approximately 15,204 acre-feet.

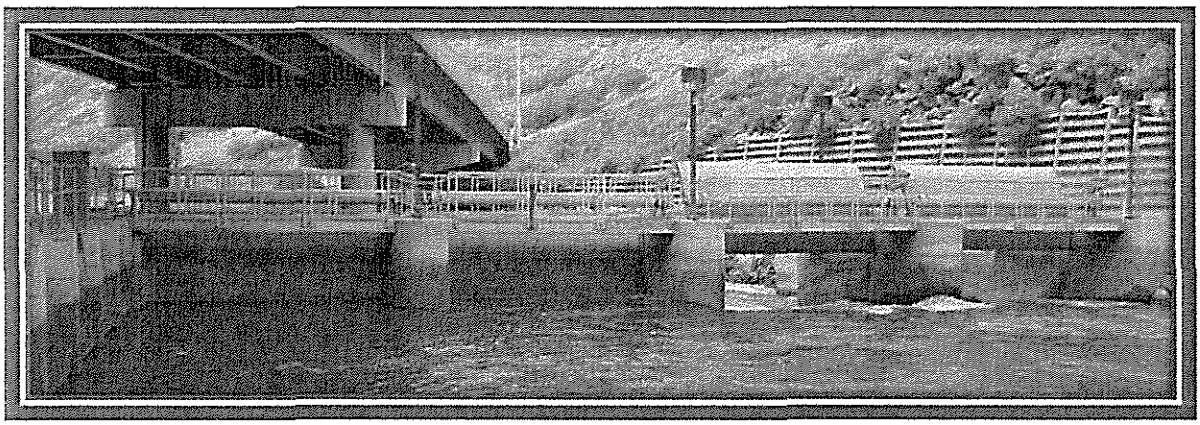
In 2014, DWCC received a WaterSMART Energy Efficiency Grant for $1 million towards a $3.05 million dollar project. The project includes metering five turnouts, placing over 4300 feet of large diameter RCP pipe in the main canal and the installation of two 10 kW small hydro power generation turbines at key locations to generate 86,400 kilowatt hours (kWh) of power per year. This project will be constructed in 2015 – 2017.

In 2011, DWCCC received a WaterSMART System Optimization Review (SOR) grant. This Plan was completed earlier this year and has identified the project priorities in their water system. This canal project has been designated as a top priority in the newly completed SOR Plan and will assist in accomplishing the goals of the Plan.

In 2009, DWCCC received a $3.6 million matching "Challenge Grant" to replace the forebay channel, river diversion structure and gates, and install 1,300 feet of box culvert located in Weber Canyon. The SCADA system was also upgraded to allow for remote operation of the new facilities. That project included 3,250 feet of two 66" diameter RCP pipes, 500 feet of triple barrel 66" diameter RCP pipes, and 1,650 feet of new open canal trapezoidal concrete liner with water stop to replace existing deteriorated concrete liner sections and areas with no liner at all. Many entities including Federal, State, County and City Governments, private property owners, water districts and shareholders have participated in and worked toward the success of DWCCC's infrastructure rehabilitation projects.

In 2005 The Company received a Water 2025 challenge grant for a water measurement and automation project. This measurement and automation project is highly successful in that it has identified areas of water savings, provided for more accurate measurements and better monitoring, established faster reaction times for emergency responses and implemented automation through-out the Canal Company's system.

New Headwork's Structure Funded with Challenge Grant Funds



Technical Project Description

Describe the work in detail, including specific activities that will be accomplished as a result of this project. This description shall have sufficient detail to permit a comprehensive evaluation of the proposal.

The proposed project will consist of enclosing 2,000 feet of open, unlined canal with a 66-inch diameter reinforced concrete pipe (RCP) in the main canal channel. This project will allow DWCCC to better manage 5,255 acre-feet of water that flows through this portion of the canal and reduce seepage which will conserve 365 acre-feet of water. The project also includes placing a 10kWh small hydro power turbine on the main canal which will produce 43,200 kWh. This power production will provide DWCCC with the ability to power their main diversion structure and still have power available to sell back to Rocky Mountain Power. The project estimated cost is $750,478. The funding request to WaterSMART is for $300,000. This project is part of an approved SOR recommendations that was approved in October of 2013. Within the SOR a feasibility report was conducted for the Small hydro portion of the project. The permits for the small hydro power project and the power sales agreement are in the process of being submitted. The Qualifying conduit hydropower facility is part of the "Hydropower Regulatory Efficiency Act of 2013." This Act will allow us to reduce the filing time and avoid

having to go through a long lengthy process. See Attachment A, B, and C for maps for the project locations and see Attachment E for the SOR Hydro Feasibility information.

Evaluation Criteria

Evaluation Criteria A: Water Conservation

Subcriterion A.1: Quantifiable Water Savings

Describe the amount of water saved. *For projects that conserve water, please state the estimated amount of water expected to be conserved (in acre-feet per year) as a direct result of this project. Please provide sufficient detail supporting how the estimate was determined, including all supporting calculations.*

- *Average annual acre-feet of water supply:*
  The average annual acre-feet of water supply for DWCCC is approximately 70,240 acre-feet (six-year measured average). Approximately 15,204 acre-feet is diverted upstream from the Company's main canal, directly from the Weber River, in Summit and Morgan Counties. The main canal is located at the mouth of Weber Canyon and is 17.22 miles long. 55,035 acre-feet of the 70,240 acre feet travels through the main canal. This project is within the main canal and located in the lower area of the canal, through which, 5,255 acre-feet of DWCCC's water is transported annually.

- *Where is the water currently going ((e.g., back to the stream, spilled at the end of the ditch, seeping into the ground, etc.)?*
  Water is seeping through the unlined canal into the ground and is also being taken up by vegetation. The soils around the canal are granular soils and allow the water to pass through very quickly.

- *Where will the conserved water go?*
  The conserved water will provide a more secure water right, be more available as a buffer during times of drought, be available for secondary use as agriculture lands convert to residential lawns and gardens, be made available for new customers and benefit the environment, fish and wildlife habitats on the Weber River through prolonged and better balanced stream flows of available water.

(1) Canal Lining/Piping

a) How has the estimated average annual water savings that will result from the project been determined? Please provide all relevant calculations, assumptions, and supporting data.

During the 2014 irrigation season DWCCC monitored the inflow-outflow along the lower 7.7 miles of canal. There is a meter in the main canal, called the "Roy Flume." This meter was verified in the spring of 2013 by an outside company and was tested to be accurate within 5%. DWCCC currently has 6 continuously recording metered turnouts and 15 turnouts with flumes and/or weirs as measuring devices along the lower portion of the canal. DWCCC took daily readings and measurements on all the non- SCADA recording flow measurement turnouts. All of the flow measurements were compiled on a monthly basis showing the water used at each turnout and how much water entered the system. Using an inflow-outflow system, the amount of water lost was determined. The total amount metered at all of the turnouts was subtracted from the Roy Flume measurements to calculate how much water was lost to the system. The total that passed through the Roy Flume was 44,586 acre-feet. The total amount delivered through the turnouts was 41,166 acre-feet. From these measurements we found that we lost 3,420 acre-feet through the 7.7 miles of the lower main canal system in 2014. The following table shows the results of the system monitoring for 2014.

Table 1 Gates and System Monitoring

Gates	Water Delivered (Acre-Feet)
WBWCD Roy Pond	1,295
North Flume	465
Roy WCD	7,259
Sunset Res	6,084
Gate 03A	234
Gate 8	165
Gate 9	7
Gate 11	483
Gate 15	2,365
Gate 18	6,745
Gate 19	253
Gate 23E	3,883
Gate 23W	4,743
Gate 24A	162
Gate 25	40
Gate 27	1,364
Gate 30IF	17,42

Gate 33	211
Layton Res	3,304
West 05 Butler	174
West 05 Kap	243
Totals	**41,166**
Total Water Delivered at Roy Flume	**44,586**
Difference or Water Lost to System	**3,420**

Drought Consideration in Developing the Actual Water Loss

In 2013 and 2014 the State of Utah was in a major state wide drought. DWCCC and its users were significantly impacted. The irrigation season was cut short by 14 days and the water users received approximately 13.4% less water than their 6-year average delivery. During the 2014 irrigation season 3,420 acre-feet of water was lost within the system, however, to project accurate water losses for a normal irrigation season, drought needs to be taken into consideration.

The normal irrigation season is 183 days. In 2013 and 2014 it was 169 days or 7.65% shorter due to the significant drought. The water losses should be increased by 7.65% to account for the shorter water season which equals 3,682 acre-feet of water losses for a normal irrigation season. The 2013 and 2014 drought restricted water availability to all shareholders, which created significant crop production losses, including dead vegetation in fields, lawns and gardens.

To better understand the actual water losses of the system a six-year average of water passing through the Roy Flume needs to be considered. The following information needs to be reflected in the account of the water losses to truly understand the genuine water losses:

- Average over five years – 51,474 acre-feet
- In 2014, that amount was 44,586 acre-feet or 13.38% less
- Therefore, the water losses should be increased by 13.38% to account for the drought
- Giving an actual water loss of **4,175 acre-feet for a normal water year**

Water Loss of the Canal Per-foot

Below the Roy Flume the main canal has 22,210 feet of unlined or deteriorating liner that the water has to pass through in order to be delivered to the DWCCC users. The water loss calculations on a per-foot bases is being distributed equally across the main canal. Given these components the water loss per-foot is as follows: **4,175/22,210 = 0.188 acre-feet per foot.**

Project Water Losses

This project will enclose 2,000 feet of unlined canal within the main canal for a total water savings of 376 acre-feet. Using a 3% loss for reinforced concrete pipe, the net water savings for the project will be 365 acre-feet per water season.

b) How have average annual canal seepage losses been determined? Have ponding and/or inflow/outflow tests been conducted to determine seepage rates under varying conditions? If so, please provide detailed descriptions of testing methods and all results. If not, please provide an explanation of the method(s) used to calculate seepage losses. All estimates should be supported with multiple sets of data/measurements from representative sections of canals.

An inflow/outflow test was done over the entire 2014 irrigation season. A known quantity of water passed the Roy Flume at the start of the lower portion of the canal. The water used at each turnout was subtracted from the total that was passing through the Roy Flume giving the total water that was lost to the system. There are currently 6 continuously metered turnouts on the canal and 15 turnouts with weirs and flumes. DWCCC took daily measurements on all of the non-continuously recording turnouts, to quantify how much water was passing through each turnout. This information was taken each month to determine water lost within the system. These calculations were used to calculate the water lost in the system.

c) What are the expected post-project seepage/leakage losses and how were these estimates determined (e.g., can data specific to the type of material being used in the project be provided)?

Reinforced concrete pipe with gasket joints will be used which has an estimated loss factor of minus 3%. These losses will be minimal and have been noted in the calculations for the water loss savings. Data specific information is available if needed. This is a commonly used material with historical loss information that is often used by Reclamation in projects.

d) What are the anticipated annual transit loss reductions in terms of acre-feet per mile for the overall project and for each section of canal included in the project?

Annual transit loss reductions are estimated to be an average of 4,175 acre-feet for 4.20 miles. This gives a loss of 994 acre-foot per mile per water season.

e) How will actual canal loss seepage reductions be verified?

The actual canal losses will be verified by using the same inflow/outflow test that was done to determine the initial losses. The Roy Flume provides a known quantity of water at the start of the lower portion of the canal. The water used at each turnout will be measured and then subtracted from the total passing through the Roy Flume. The remaining amount of water will be the total water lost to the system after the project has been completed.

DWCCC will take daily measurements on all of the non-recording water flow measurement devices to quantify how much water has passed through these turnouts. The information will be documented and calculated on a monthly basis. This will allow the Company to monitor and measure the benefits of the project to the water losses of the system.

f) Include a detailed description of the materials being used.

The pipe for the project will be a 66-inch reinforced concrete pipe with o-ring gasket at each joint to prevent water seepage. Concrete manholes will be used at the connection points as the pipe is connected to exiting pipes within the project area.

Subcriterion A.2: Percentage of Total Supply

Provide the percentage of total water supply conserved: *State the applicant's total average annual water supply in acre-feet. Please use the following formula:*

The Company's average annual water supply is 70,240 acre-feet however the water diverted down the main canal, where this project will be located, is 55,036 acre-feet. It was previously indicated that 15,204 acre-feet of the 70,240 acre-feet of annual water supply is diverted directly from the Weber River in the Summit and Morgan Counties area before entering the main canal. Therefore the average annual supply for the main canal is estimated at 55,036 acre-feet.

With these improvements to the canal, DWCCC will successfully better manage approximately 5,255 acre-feet of water that flows through the project area within the lower section of the main canal. Because of the amount of water that flows through this section of canal,

$$\frac{\textit{Estimated Amount of Water Better Managed}}{\textit{Average Annual Water Supply}}$$

$$\frac{\textbf{5,255 acre-feet}}{\textbf{55,036 acre-feet}} = \textbf{9.5\% Water Better Managed}$$

Evaluation Criteria B: Energy-Water Nexus

Subcriterion B.1: Implementing Renewable Energy Projects Related to Water Management and Delivery

Describe the amount of energy capacity. *For projects that implement renewable energy systems, state the estimated amount of capacity (in kilowatts) of the system. Please provide sufficient detail supporting the stated estimate, including all calculations in support of the estimate.*

The approved System Optimization Review for the Davis & Weber Canal included a feasibility study for hydropower generation along the canal. The SOR reviewed two location scenarios for power generation. The one that will be part of this project will include the installation of small hydro power generation in the main canal. These small hydro power generation sites will provide a good source of renewable energy. The small hydro site part of this project is estimated at 10kW. The calculations are included as part of the SOR and can be found in Attachment E, SOR Hydro Feasibility. The DWCCC uses on average 464,366 kWh per year of electricity.

Describe the amount of energy generated. *For projects that implement renewable energy systems, state the estimated amount of energy that the system will generate (in kilowatt hours per year). Please provide sufficient detail supporting the stated estimate, including all calculations in support of the estimate.*

The SOR identified that the small hydro power generation could operate the entire time that the canal in is use from April 15th to October 15th. The turbine would operate for 4,320 hours during this time. The small hydro generator produces 10kW. Each site would generate 43,200 kilowatt hours per year. This project is part of an approved SOR that was approved in October of 2013. Within the SOR a feasibility report was conducted for the Small hydro portion of the project. See Attachment E, SOR Hydro Feasibility.

Describe any other benefits of the renewable energy project. *Please describe and provide sufficient detail on any additional benefits expected to result from the renewable energy project, including:*

- *Expected environmental benefits of the renewable energy system*

This renewable energy source will operate during the months of the peak electrical energy uses and could be used to power DWCCC's river diversion and other high energy locations. The balance of power generated not being used by DWCCC can be sold back to Rocky Mountain Power. This facility will help reduce the need to use more fossil fuels to meet the energy demands of the Company.

• Any expected reduction in the use of energy currently supplied through a Reclamation project

Electricity along the Wasatch Front comes from a variety of sources. One of those sources is the hydropower at Rockport Reservoir which is a Reclamation project. It is unlikely that this project will have any impact on hydro power generation from the Reclamation projects in the area.

• Anticipated beneficiaries, other than the applicant, of the renewable energy system

Although this is a small amount of power in the overall scheme of things, the power generated will allow the Company to run its main river diversion gates and other high energy demands such as pumping and have plenty of power to spare which can be sold back to Rocky Mountain Power, thus benefiting on a small scale the population along the Wasatch Front. The old saying "every little bit helps" is true in this case, because it is just the beginning of opportunities for renewable energy for the Company.

• Expected water needs of the renewable energy system

The small hydro generator will be placed in the main canal and will be operated by the water that flows through the canal to the users. No additional water will be needed to operate the generator and, the generator will not use any water.

Subcriterion No. B.2: Increasing Energy Efficiency in Water Management
Describe any energy efficiencies that are expected to result from implementation of the water conservation or water management project (e.g., reduced pumping).
• Please provide sufficient detail supporting the calculation of any energy savings expected to result from water conservation improvements. If quantifiable energy savings are expected to result from water conservation improvements, please provide sufficient details and supporting calculations. If quantifying energy savings, please state the estimated amount in kilowatt hours per year.

DWCCC has always had a gravity-fed system and this will still be the case with the development of this project. The completion of this project will reduce the time, energy, and money spent to monitor these critical sections of the canal. During the irrigation season the DWCCC staff is required to drive the canal twice a day to monitor the canal and evaluate these critical areas. The development of this project will allow the DWCCC staff to reduce their 40 mile round trips from twice daily to only once daily. The savings will be in vehicle miles traveled, gasoline consumed, decreased CO2 pollutants released, and man hours saved.

•Please describe the current pumping requirements and the types of pumps (e.g., size) currently being used. How would the proposed project impact the current pumping requirements?

Due to the elevation of the canal, users are not required to pump to receive their allotment of water. However the secondary irrigation system that provides pressurized water is pumped. These systems have several pumping stations: two pumps below the Kaysville East reservoir, five pumps in Clinton City and six pumps in West Point which are all part of the average annual kWh total of 464,366 kWh used by the DWCCC.

•Please indicate whether you energy savings estimate originates from the point of diversion, or whether the estimate is based upon an alternate site of origin.

The energy savings are based upon miles of round trip from the current point of diversion.

•Does the calculation include the energy required to treat the water?

No. The system does not require treatment of the water. However there are 6 large automated travelling screens that remove large debris from the canal before entering pressurized pipes. The power generated would also help offset the costs of screening the water.

•Will the project result in reduced vehicle miles driven, in turn reducing carbon emissions? Please provide supporting details and calculations. Describe any renewable energy components that will result in minimal energy savings/production (e.g., installing small-scale solar as part of a SCADA system).

The completion of this project will reduce the time, energy, and money spent to monitor these critical sections of the canal daily during the irrigation season by incorporating these areas into the SCADA system. The savings will be in fewer vehicle miles traveled, reduced gasoline consumption, decreased CO2 pollutants released and more man hours saved. At 40 miles per round trip, checking the canal twice a day; the canal rider travels 560 miles per week over the 6 month irrigation season, which equates to 14,720 miles an irrigation season. If we can cut the trips by half (7,360 miles) per irrigation season we will realize savings that will consist of the following:

Traveling only once a day at 40 miles per round trip would equate to a savings of 7,360 miles per irrigation season. Calculation of CO2 and social cost of the Carbon based emissions on 3% discount rate per ton and price for gasoline that comes from

information provided by FHWA Benefits Cost Analysis Resource Guide. Calculation and information for the CO2 metric tons saved comes from the "Carbon Foot Print" website located at www.carbonfootprint.com/calculator.aspx
The following are the assumptions made:

» Assume 14 mpg for a 2004 Ford F150 four wheel drive
» Assume fuel cost at 3.39 per gallon
» Assume a Social Cost of Carbon discounted at 3% per ton

Gasoline savings: Savings of $1,782.00

Pollution savings: Savings of 10.8 metric tons of CO2 per year, which equates to a Social Cost of Carbon per ton at $22.80 which equals savings of $246.00 per year saved. Discounted by 3% is $238.85. Not to mention less carbon emissions into the atmosphere and stratosphere. This analysis does not include the savings for monitoring the pump stations and automated traveling screens twice daily as well.

Evaluation Criterion C: Benefits to Endangered Species

For projects that will directly benefit federally-recognized candidate species, please include the following elements:

•What is the relationship of the species to water supply?

The development of this project will allow for more water to be saved and held in Echo and East Canyon Reservoirs and within the Weber River system. After talking with Ben Nadolski from the Utah Department of Wildlife Resources (UDWR), he indicated that if we could allow more water to run down the Weber River during the irrigation season it would help the Bonneville Cutthroat Trout and Bluehead Sucker which are listed on the state's sensitive species list. DWCCC is committed to working with the UDWR and establishing a percentage of the saved water to be released at critical times when the UDWR feels this could enhance the habitat for the Bonneville Cutthroat Trout and Bluehead Sucker. DWCCC has indicated that it would negotiate releasing anywhere from 5% to 10% of the water saved from this project. As DWCCC continues to fix the rest of the lower canal they would also work with the UDWR to release a portion of the other water saved. See a letter of support from the UDWR under Letters of Support

Losses within the lower main canal equate to 4,175 acre-feet per irrigation season. The ability to reduce these losses will allow DWCCC to save the water within the reservoirs and river to be used for other beneficial uses. This project will begin decreasing the losses and will strengthen a working relationship with UDWR, U.S. Fish and Wildlife (USFWS), DWCCC, and Weber River Waters Users Association

(WRWUA) by implementing guidelines and requirements which will allow for more water to remain in the Weber River, Echo and East Canyon Reservoirs. Thus allowing for better water quality within the each of these zones.

Based upon information obtained from UDWR, there are recent documented occurrences of the Bonneville Cutthroat Trout within a 2 mile radius of the Weber River in the area near Echo Reservoir. As well as recent occurrences for the bald eagle and bluehead sucker within ½ mile of the Echo reservoir all of which are included on the Utah Sensitive Species List. Although this project does not directly enhance the habitats for the species listed above, it is proven and documented that by allowing for more available water to stay within the habitat areas for longer periods of time, these species are benefited.

Information obtained from the most recently developed Environmental Report, being submitted to Reclamation at the end of January 2015 that includes listings in this project area, shows the following being listed:
Federally Listed and Endangered (E), Threatened (T), and Candidate (C) species that could be positively affected by additional water supply. The U.S. Fish and Wildlife Service identify these species as known and are believed to be in Davis, Weber, Morgan and Summit Counties.
(C) Greater Sage Grouse (Centrocercus urophasianus)
(C) Yellow Billed Cuckoo (Coccyzus americanus)
(C) Least Chub (Lotichthys phlegethontis)
(E) June Sucker (Chasmistes liorus)
(T) Canada Lynx (Lynx canadensis)

•What is the extent to which the proposed project would reduce the likelihood of listing or would otherwise improve the status of these species?

Low stream flows affect many aspects of the Weber River and Echo Reservoir, whether above the headworks of DWCCC or below them. Over the past several years major improvements to the canal system has allowed increased flows and higher water quality within the Weber River. This allows for increased benefits to all listed and non-listed fish species. While it is unknown as to the effect this project will have on other species besides the Bonneville Cutthroat Trout and the Bluehead Sucker the ability to conserve water and make it available in the Weber River and Echo Reservoir will allow for better flows and take necessary steps in the right direction to protect and conserve native species. With DWCCC's our relationship with the UDWR we will be establishing a percentage (5% to 10%) of water, saved form this project, which can be delivered to the river at the most critical times or of the year.

For projects that will directly accelerate the recovery of threatened or endangered species or address designated critical habitats, please include the following elements:

(1) How is the species adversely affected by a Reclamation project?
N/A

(2) Is the species subject to a recovery plan or conservation plan under the ESA?

Both species are covered by conservation agreements that the State of Utah has entered into with the U.S. Fish and Wildlife Services. The population status of these two sensitive species warrants additional conservation efforts to diminish the likelihood of future listings under the endangered Species Act.

(3) What is the extent to which the proposed project would reduce the likelihood of listing or would otherwise improve the status of the species?

This project alone will not reduce the likelihood of listing but it is a step in the right direction. The Company and UDWR are willing to work together to allow for more water to flow at some of the most critical times of the year. This alone could improve the habitat and enhance the continuity of the Weber River.

Evaluation Criterion D: Water Marketing

Estimated amount of water to be marketed

DWCCC will set aside 10% or 36 acre-feet of water for new customers. The remaining conserved water will be used to back-up the water right in times of drought or water shortage with a portion (5% to10%) being used to benefit habitats negotiated with UDWR.

- *A detailed description of the mechanism through which water will be marketed (e.g., individual sale, contribution to an existing market, the creation of a new water market, or construction of a recharge facility)*

  DWCCC provides pressure irrigation to 5 cities. When development comes the developer is required to bring in irrigation water as shares or acre feet. If water is not available for these properties, they have the option of purchasing shares, if available for purchase, or contracting for wholesale water through the Weber Basin Water Conservancy District. DWCCC will offer a portion of the conserved water resulting from this project available to those property owners located

within DWCCC's existing service area to be made available to contract for delivery through their pressure irrigation system. These property owners would all be new customers to DWCCC.

Currently, there is approximately 98 acre-feet of Weber Basin wholesale water delivered to users through the DWCCC system and by making a portion of this conserved water available Weber Basin (a Reclamation Project) can free up water for other uses in their system.

- *Number of users, types of water use, etc. in the water market*

  The 36 acre-feet could supply lawn and garden irrigation water to approximately 36 new customers. All the water would still be agricultural water and supplied to users through the pressure irrigation system.

- *A description of any legal issues pertaining to water marketing(e.g., restrictions under Reclamation law or contracts, individual project authorities, or State water laws)*

  Utah State law does not currently allow for water marketing. However, marketing this water to new customers within the existing service areas as described above does not violate any state laws.

- *Estimated duration of the water market*
  There would be no time limit on the duration of the water market. This conserved water would be treated just as the Weber Basin wholesale water and remain in the system as long as it can be beneficially used.

Evaluation Criterion E: Other Contributions to Water Supply Sustainability

Subcriterion E.1: Addressing Adaptation Strategies in a WaterSMART Basin Study

- *Identify the specific WaterSMART Basin Study where this adaptation strategy was developed. Describe in detail the adaptation strategy that will be implemented through this WaterSMART Grant project, and how the proposed WaterSMART Grant project would help implement the adaptation strategy.*

  The Weber River Basin Plan of 2009 indicates, in Chapter 4 of the plan, several conservation goals that they would like to implement, most of which this project will help to satisfy. The specific goal that this project will help implement is to help reduce outdoor use through monitoring and more efficient application and delivery of the water.

Weber River Waters Users association developed a "Water Management and Conservation Plan" in 2009 with a Reclamation grant, addressing the needs for the Weber River Basin. Within the Plan, Section 6, Issues and Goals; Issue 2, Condition of Existing Facilities, addresses aging water facilities and being proactive in caring for its facilities and encouraging those who carry Project water to upgrade their conveyance systems. This project helps to fulfill this goal by piping and lining 2000 feet pipe through the main delivery system.

This project will help to fulfill Goal 5 in Section 7 of the plan. (See Attachment F Planning Documents) Within the Weber Water Users 2009 Water Management Plan, Goal 5 addresses the support of an upgrade of Davis & Weber Canal Facilities. This goal indicates that DWCCC has made big strides over the past 10 years to do a number of "Capital Improvement" projects. The Plan indicates that the Association should work in cooperation with DWCCC to complete the rehabilitation of the canal. It also lists the primary objectives of the projects being to improve the safety of the structure, conserve water by reducing seepage losses and provide for more efficient operation and maintenance. With significant residential development occurring adjacent to the canal in recent year's public safety has come to the forefront of the Association and DWCCC.

DWCCC completed a SOR for the 17.2 mile canal system in October 2013. A copy of the project priorities is included in Attachment F Planning Documents. The proposed project is included in number 4 and 5 on the SOR High Priorities project list. Project priority number 1 was constructed in 2014 and priority number 2 and portion of priority number 4 are scheduled for construction in 2015-2016.

DWCCC has a Conservation Plan which includes aspects of this project. They also have Emergency Action and Response Plans, and an Operation and Management Plan, which includes responses during drought or water shortage conditions. They also participated in developing a conservation plan with the Weber River Water Users Association, which has recently been updated. (Copies of these plans can be made available upon request)

Other plans this project is consistent with and include the State Regional Water Plan for the Weber River Basin. In the "Weber River Basin Planning for the Future" document prepared in September 2009 it states:

> "*In order to meet future water needs, water planners and managers within the Weber River Basin must promote effective*

water conservation programs and measures. They must also ensure that agricultural water conversions are transferred to meet both indoor and outdoor urban water needs, and implement innovative water management strategies. This, along with carefully planned water developments, will secure sufficient water for the future."

The current DWCCC proposed projects help to fulfill these goals.

Subcriterion E.2: Expediting Future On-Farm Irrigation Improvements

Include a detailed listing of the fields and acreage that may be improved in the future.

DWCCC provides water to approximately 100 different ditches and turnouts. The canal system is elevated so that anyone could connect on to the canal to provide sufficient pressure for an agricultural sprinkler system. This project will not change that ability to provide pressure irrigation to farms. This project will be a positive move toward ensuring that shareholders will receive their shares of water through a canal that is metered, piped, and lined, so that losses are minimal and conservation is maximized, hydro power is developed, the environment is protected and the canal is made safe and water can be delivered efficiently.

The Company is aware of a few local farm projects that are being considered, most of which are ditch expansions, piping of ditches, and conversion of water deliveries from flood irrigation to sprinklers. The following is a list of those who have talked to DWCCC about the opportunity to apply for AWP funds:

Name Ditch	Area	Location
Gail Flinders	15	1300 North Clearfield/Sunset/West Point
Lynn Kirkman	18 & 15	West Point
John Green	23 East Gate	2200 West Layton
Golden Waite	23 East Gate	2200 West Layton
Vernon Flint	30	Layton/ Kaysville
Cleve Dibble	23 East	West Layton
James Call	23 East Gate	West Layton
Bill Day	23 East	West Layton

- *Describe in detail the on-farm improvements that can be made as a result of this project. Include discussion of any planned or ongoing efforts by farmers/ranchers that receive water from the applicant.*

  This project will help provide a safer, more reliable, and more efficient water delivery system for the canal. This will allow farmers to install pipes, sprinklers

and pivots to make their irrigation systems more efficient and will also allow for higher crop yields and less flooding potentials in residential neighborhoods that are continual encroaching on the agricultural lands.

- *Provide a detailed explanation of how the proposed WaterSMART Grant project would help to expedite such on-farm efficiency improvements.*

  1- Less tail water wasting from flood irrigation
  2- Better metering and monitoring of system
  3- Innovation for better technologies such as sprinkler and drip irrigation methods

- *Fully describe the on-farm water conservation or water use efficiency benefits that would result from the enabled on-farm component of this project. Estimate the potential on-farm water savings that could result in acre-feet per year. Include support or backup documentation for any calculations or assumptions.*

  Based upon calculation and information submitted already as part of this application returned savings in water for agriculture would be between 8 to 10% water savings, besides creation of additional water resources through conservation that will benefit future water development needs. Better use of the water will come about by reducing water wasting and losses due to seepage this request has outlined the water savings in detail.

- *Projects that include significant on-farm irrigation improvements should demonstrate the eligibility, commitment, and number or percentage of shareholders who plan to participate in any available NRCS funding programs. Applicants should provide letters of intent from farmers/ranchers in the affected project areas.*

  The eight listed farm projects previously listed have expressed strong interest in participating through NRCS funding programs to accomplish similar goals as are listed in this application. These projects will allow for better safety and conservation.

- *Describe the extent to which this project complements an existing or newly awarded NRCS funded project.*

  There have been several canal lining and piping projects through WaterSMART grant awards that have been completed and which are proven examples in the accomplishment of goals similar, if not identical to the goals of this project.

Subcriterion E.3: Building Drought Resiliency

- *Explain in detail the existing or recent drought conditions in the project area. Describe the severity and duration of drought conditions in the project area. Describe how the water source that is the focus of this project (river, aquifer, or other source of supply) is impacted by drought. Describe the impacts that are occurring now or are expected to occur as a result of drought conditions. Provide a detailed explanation of how the proposed WaterSMART Grant project will improve the reliability of water supplies during times of drought. For example, will the proposed project prevent the loss of permanent crops and/or minimize economic losses from drought conditions? Will the project improve the reliability of water supplies for people, agriculture, and/or the environment during times of drought?*

  Drought - DWCCC potential shortfalls from drought can and have had an impact on the current water supply. The State of Utah does not have a detailed drought management plan, but has made strides since the severe drought of the late 1990's and early 2000 years. However, extreme concerns exist in the DWCCC service area which caused them to redefine their drought mitigation plans and implementations on an annual basis. In 2012, 2013, and 2014, the snowpack was minimal at best.

  The Canal Company was forced to start using their storage water much earlier than normal. The irrigation season was cut short by 14 days in 2013 and 2014 and in 2012 the Company received only 40 days of natural flow from the Weber River for the season. This required the company to request all users to limit their water usage very early in the season and throughout the year. The droughts have severely impacted the amount of storage water available at the end of each irrigation season. It looks like the area could be in a drought situation again this year (2015). If the natural flow rights are not available, the Company may not be able to provide enough water to its end users. The transmission losses on the lower main canal will complicate the already severe water shortages. The losses of water from seepage, potential flooding and drought conditions make this a high priority project in 2015-2016 on the lower main canal.

Subcriterion E.4: Other Water Supply Sustainability Benefits

Will the project make water available to address a specific concern? For example: Will the project directly address a heightened competition for finite water supplies and over-allocation (e.g., population growth)? Describe how the water source that is the focus of this project (river, aquifer, or other source of supply) is impacted by climate variation. Will the project help to address an issue that could potentially result in an interruption to the water supply if unresolved?

Utah Division of Water Rights website indicates that Surface waters supplies are generally considered to be fully appropriated in Davis and Weber Counties. New diversions and consumptive uses in these areas must be accomplished through change applications filed on existing rights or by proofs of additional water made available due to sound conservation efforts. Non-consumptive use applications, such as hydroelectric power generation, will be considered on their individual merits.

There is a limited ground-water resource available. New appropriations from the principal aquifer are limited to 1.0 acre-foot per year for fixed-time periods in areas not served by a public supply system. These filings are to connect to public supply systems when they are available. Large projects must be accomplished by change applications on existing rights. Changes from surface to underground sources, and vice versa, are also considered on their individual merits, with emphasis on their potential to interfere with existing rights and to ensure that there is no enlargement of the underlying rights. Possibilities for development and implementation of water re-use is currently being investigated.

Therefore the Basin is closed for new available rights. This makes it difficult for growing communities in the Basin where DWCCC supplies water. The 2010 Census provides some interesting insights into population growth in Utah and the Weber River Basin water drainage area. According to the Census, two of the four most highly populated counties in Utah are Davis and Weber Counties. Davis County population saw an increase of 28.2% between 2000 and 2010 and Weber County increased by 17.7% but water supplies have remained the same for the most part.

- *Will the project make additional water available for Indian tribes?*

  N/A

- *Will the project make water available for rural or economically disadvantaged communities?*

  Yes, Sunset City and Roy City are listed as economically disadvantaged communities and they both receive secondary water from DWCCC.

- *Does the project promote and encourage collaboration among parties? Is there widespread support for the project? What is the significance of the collaboration/support?*

  This project has the support of all DWCCC water users, Clearfield City, Sunset City, Syracuse City, West Point City, Layton City, Kaysville City, South Weber

City, Riverdale City, West Haven City, Clinton City, Weber Basin Water Conservancy District, Roy Water Conservancy District, the Utah Board of Water Resources, Weber River Water Users Association, Weber River Water Rights Committee, UDWR, and the Utah State Engineer's Office.

The support of the Cities, State of Utah Conservancy Districts, and all water users will allow DWCCC to work quickly through the process to construct the project. The project will be completed on property owned by DWCCC.

- *Will the project help to prevent a water-related crisis or conflict?*

  Yes, as mentioned previously, canal deterioration causes seepage and could result in a breach which could flood residential areas and disrupt services. This project will pipe or reconstruct open canal to prevent water losses and a potential breach.

- *Is there frequently tension or litigation over water in the basin?*

  There is always tension when it comes to water. Natural disasters, drought, and un-maintained canals and ditches seem to be the major factors in developing tension within any service area. DWCCC has had its share and, will continue to feel the tension especially as demands for more water come from expanding residential growth. However, in the past two years there has been more tension than usual. Lack of water because of the SOD work at Echo Reservoir, the drought situation (irrigation season shortened by 14 days), and seepage losses within the main canal have increased the tension levels from medium to high.

  The tension this year stems from three issues 1) the drought, 2) water seepage and other losses, and 3) work on the Echo Reservoir. All of these issues contributed to limited water availability to all users. This tension will continue and could be far worse if DWCCC does not move forward with this project.

- *Is the possibility of future water conservation improvements by other water users enhanced by completion of this project?*

  Yes. This project will allow other users along this area of the canal to pipe their own ditches and/or install their own sprinkling systems. If they enhanced their own ditches and developed a sprinkling system they could realize significant water savings as well as potential for higher crop yields.

- *Will the project increase awareness of water and/or energy conservation and efficiency efforts? Will the project serve as an example of water and/or energy conservation and efficiency within a community?*

  Yes. The Small hydro power generation can be used as an example to other canal companies in the region that do not have a large drop component within their system. They will recognize that power can be generated within their own canal system.

- *Will the project increase the capability of future water conservation or energy efficiency efforts for use by others?*

  Yes. DWCCC has plans to incorporate many of these small hydro turbines within their canal system that could produce enough energy to run some of the local farms i.e. pumps, out buildings, meters, automated screens, etc.

- *Does the project integrate water and energy components?*

  Yes. The project has both a water conservation of 365 acre-feet and a renewable energy component of 43,200 kWh.

Evaluation Criterion F: Implementation and Results

Subcriterion No. F.1: Project Planning

Does the project have a Water Conservation Plan, System Optimization Review (SOR), and/or district or geographic area drought contingency plans in place? Does the project relate/have a nexus to an adaptation strategy developed as part of a WaterSMART Basin Study)? Please self-certify, or provide copies of these plans where appropriate, to verify that such a plan is in place.

Provide the following information regarding project planning:

(1) Identify any district-wide, or system-wide, planning that provides support for the proposed project. This could include a Water Conservation Plan, SOR, Basin Study, drought contingency plan, or other planning efforts done to determine the priority of this project in relation to other potential projects.

Weber River Waters Users' Association developed a "Water Management and Conservation Plan" in 2009 with a Reclamation grant, addressing the needs for the Weber River Basin. The Weber River Basin Plan of 2009 indicates, in Chapter 4 of the plan, several conservation goals that they would like to implement, most of which this project will help to satisfy. The specific goal that this project will help

implement is to help reduce outdoor use through monitoring and more efficient application and delivery of the water.

DWCCC completed a SOR for the 17.2 mile canal system in October 2013. A copy of the project priorities is included in Attachment F Planning Documents. The proposed project is included in number 4 and 5 on the SOR High Priorities project list. Project priority number 1 was constructed in 2014 and priority number 2 and portion of priority number 4 are scheduled for construction in 2015-2016.

DWCCC has a Conservation Plan which includes aspects of this project. They also have an Emergency Action and Response Plans, and an Operation and Management Plan, which includes responses during times of drought or water shortage conditions. They also participated in developing a conservation plan with the Weber River Water Users' Association, which has recently been updated. (Copies of these plans can be made available upon request)

(2) Describe how the project conforms to and meets the goals of any applicable planning efforts, and identify any aspect of the project that implements a feature of an existing water plan(s).

The Weber River Water Users' Association has a number of goals and issues that this project will help to fulfill. They have been addressed previously and are listed in Criterion E Subcriterion E1. Other plans that this project is consistent with is the State Regional Water Plan for the Weber River Basin. In the "Weber River Basin Planning for the Future" document prepared in September 2009 it states:

> *"In order to meet future water needs, water planners and managers within the Weber River Basin must promote effective water conservation programs and measures. They must also ensure that agricultural water conversions are transferred to meet both indoor and outdoor urban water needs, and implement innovative water management strategies. This, along with carefully planned water developments, will secure sufficient water for the future."*

Subcriterion No. F.2: Readiness to Proceed

Points may be awarded based upon the extent to which the proposed project is capable of proceeding upon entering into a financial assistance agreement.

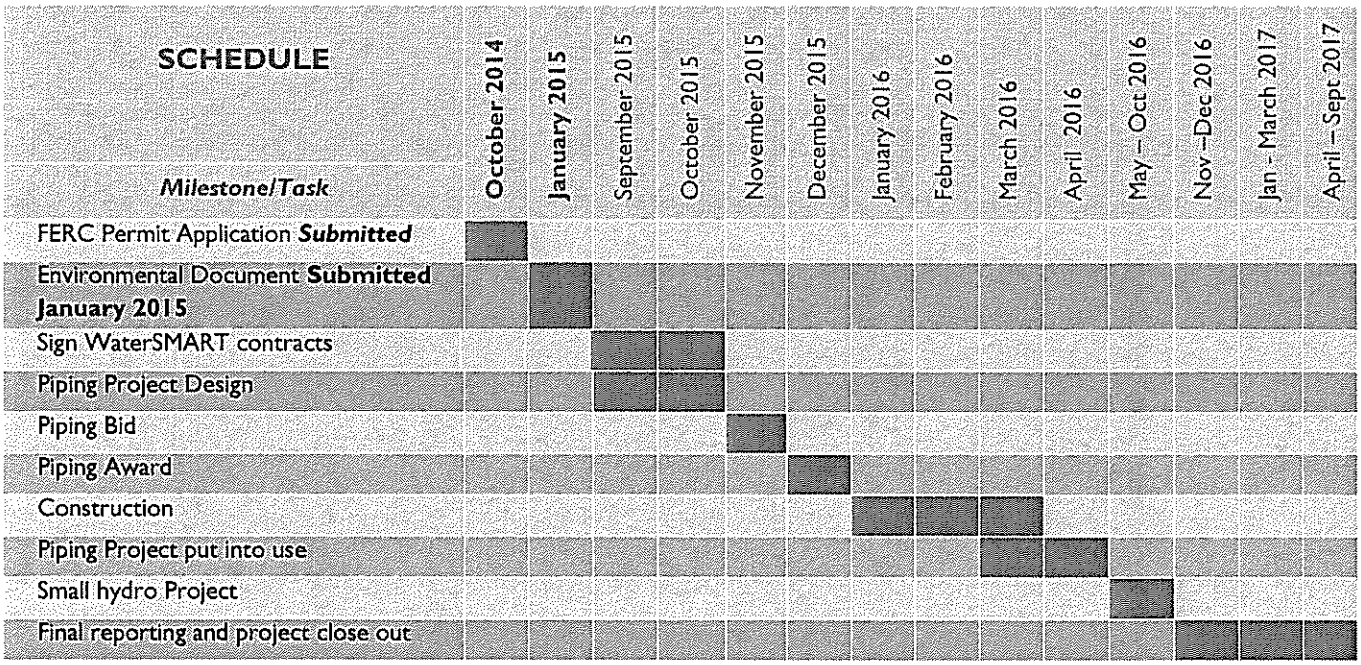
Describe the implementation plan of the proposed project. Please include an estimated project schedule that shows the stages and duration of the proposed work, including major tasks, milestones, and dates.

The environmental has been completed and submitted to Reclamation for their approval. The project is located on private land belonging to DWCCC and is not within a Reclamation project. The permits for the small hydro power have been submitted with the application to construct two similar sites in 2016. The estimated completion of this project is based upon contractual approvals and should take three to four months to complete.

The preliminary master planning for the piping component of the project and a hydraulic analysis of the hydro portion have both been completed as part of an approved System Optimization Review (SOR).

Estimated project schedule that shows the stages and duration of the proposed work, including major tasks, milestones, and dates.

» **Table 2 Project Schedule**



Please explain any permits that will be required, along with the process for obtaining such permits. Identify and describe any engineering or design work performed specifically in support of the proposed project.

A FERC permit will be required for the small hydro generator. An application has been submitted for another project with two similar small hydropower facilities and the small hydro generator for this project has been included in the application. It is expected to take 3 to 6 months to obtain the permit. The Company is anticipating qualifying for a "Qualified Conduit Hydropower facility "under the provision of the

Hydropower Regulatory Efficiency Act of 2013 or a Conduit Exemption. No other permits will be required.

Subcriterion No. F.3: Performance Measures

Provide a brief summary describing the performance measure that will be used to quantify actual benefits upon completion of the project (e.g., water saved, marketed, or better managed, or energy saved).

There are two areas of this project where performance measures can be documented and quantified to show the actual benefits upon completion of the project. They include renewable energy that will be generated and water that is saved and/or better managed.

Energy Generated Performance Measures

The System Optimization Review included a feasibility report for Hydroelectric Power Generation and within this feasibility report Small hydro power generation was investigated. The report made some assumptions by estimating the power of free flowing water and with the timeline (April – October) in which the turbines would be operation to calculate the amount of kWh that would be generated. The performance measures will use these calculation to make a comparison of the actual number of kWh that will be recorded on the meter. A reading of the meter will be made monthly and recorded. Then a calculation and comparison will be established to show the performance measures. These monthly reports will be summarized annually in November and reported to the Board of Directors.

Water Savings and/or Better Water Management Performance Measures

The recently completed System Optimization Review identifies the water tracking and water usage procedures for the DWCCC canal. These are the same procedures that were followed to calculate the water losses in this application. The same procedures will be used to measure the actual water saved/better managed after the completion of this project.

Figure 1 Daily Turnout Measurements Sheet

Byram Estates	Measurements (CFS)	Estimated Delivery (CFS)	Total Estimated Delivered (Acre-Feet)	Flow Alotment (CFS per day)	Total Alotment (Acre-Feet)	Running Total Available (Acre-Feet)
April 15, 2013				-	-	-
April 16, 2013				4.64	9.19	9.19
April 17, 2013				4.64	18.39	18.39
April 18, 2013				4.64	27.58	27.58
April 19, 2013				4.64	36.78	36.78
April 20, 2013				4.64	45.97	45.97
April 21, 2013				4.64	55.17	55.17
April 22, 2013				4.64	64.36	64.36
April 23, 2013				4.64	73.56	73.56
April 24, 2013				4.64	82.75	82.75
April 25, 2013				4.64	91.95	91.95
April 26, 2013				4.64	101.14	101.14
April 27, 2013				4.64	110.34	110.34
April 28, 2013				4.64	119.53	119.53
April 29, 2013				4.64	128.73	128.73
April 30, 2013				4.64	137.92	137.92

An inflow and outflow summary of the lower portions of the canal will be taken: There is a meter on the main canal, called the "Roy Flume", at the start of the lower portion of the canal. DWCCC currently has 6 continuously reading meter turnouts and 15 turnouts with weirs and flumes along the lower portion of the canal. Daily flow measurements at each turnout and flow measuring device readings are taken and recorded. On the 15th of each month measurements will be taken and used to determine how much water has passed the Roy Flume, how much water went down each turnout, and how much water was lost to the system for that month. The water lost for the entire irrigation season will be compared to the water savings calculations in this application. A portion of the gate usage tracking sheet are shown in Figure 1, Daily Turnout Measurement Sheet.

The individual gates are combined into a summary of all gates on the lower canal. The sheet in Figure 2, Summery Sheet is a sample of how the information will be recorded. This summary sheet will be completed the 15th of each month and reviewed with the DWCCC Board of Directors

The water marketed as part of this project will be managed by tracking the amount of conserved water that is contracted to new customers and will be submitted in a report to the DWCCC Board of Directors semi-annually.

Figure 2 Summery Sheet

Gate	Estimated Water Delivered (Acre-Feet)	Water Allocated To Date (Acre-Feet)	Water Allocated For Year (Acre-Feet)	Difference Column 1-2 (Acre-Feet)	Total Remaining for Year Column 3-1 (Acre-Feet)
WBWCD Gateway					
WBWCD Roy Pond					
Byram Estates					
North Flume					
North 10					
North 11					
Roy WCD					
Sunset Res					
Gate 03A					
Gate 8					
Gate 11					
Gate 15					
Gate 16					
Gate 18					
Gate 19					
Gate 23E					
Gate 23W					
Gate 24A					
Gate 25					
Gate 27					
Gate 30IF					
Gate 30JS					
Gate 33					
Layton Res					
West 05 Butler					
West 05 Kap					
Totals					

Subcriterion No. F.4: Reasonableness of Costs

Please include information related to the total project cost, annual acre-feet conserved, energy capacity, or other project benefits and the expected life of the improvement(s).

Total project cost: $ 750,478
Annual acre-feet conserved (or better managed): 5,255 acre-feet will be better managed and 365 acre-feet conserved
Renewable energy produced: 43,200 kWh

For all projects involving physical improvements, specify the expected life of the improvement in number of years and provide support for the expectation (e.g., manufacturer's guarantee, industry accepted life-expectancy, description of corrosion mitigation for ferrous pipe and fittings, etc.).

Expected life of the improvement: 80 years
Support for expectation: The U.S. Army Corps of Engineers in manual No. 1110-2-2902 dated October 31, 1997 gives reinforced concrete pipe a 70 to 100 year life. We have used an improvement life of 80 years. This matches the improvement life use in the System Optimization Review that was recently completed on the canal. (Please see Attachment D Technical Support)

Evaluation Criterion G: Additional Non-Federal Funding

$$\frac{\$450{,}000.00 \text{ Non-Federal Funding}}{\$750{,}478.00 \text{ Total Project Cost}} = 59.96\%$$

Evaluation Criterion H: Connection to Reclamation Project Activities

(1) How is the proposed project connected to Reclamation project activities?

Weber Basin Water Conservancy District is a major shareholder in DWCCC and supplies water to Reclamation projects. Water supplies for the DWCCC canal came from East Canyon and Echo Reservoirs which are both Reclamation projects.

(2) Does the applicant receive Reclamation project water?

Yes. DWCCC receives water from Echo and East Canyon Reservoirs, which are Reclamation projects.

(3) Is the project on Reclamation project lands or involving Reclamation facilities?

No.

(4) Is the project in the same basin as a Reclamation project or activity?

Yes, the project is located in the Weber River Basin where Echo and East Canyon Reservoirs are located.

(5) Will the proposed work contribute water to a basin where a Reclamation project is located?

Yes, the project will conserve water that can now be held up in Echo and East Canyon Reservoirs contributing to the storage and potential flow of the Weber River.

(6) Will the project help Reclamation meet trust responsibilities to Tribes?

No.

Environmental and Cultural Resources Compliance

1. *Will the project impact the surrounding environment (e.g., soil [dust], air, water [quality and quantity], animal habitat)? Please briefly describe all earth-disturbing work and any work that will affect the air, water, or animal habitat in the project area. Please also explain the impacts of such work on the surrounding environment and any steps that could be taken to minimize the impacts.*

   Impacts will be those associated with piping the canal and trenching for the conduit for the Small hydro turbines. The proposed project improvements will take place entirely within the existing canal corridor. In the past similar projects have had minimal impacts. This proposed area of the canal to be improved has an established access allowing work within the recognized easement of the project. The surface vegetation will be restored upon completion of the project.

2. *Are you aware of any species listed or proposed to be listed as a Federal threatened or endangered species, or designated critical habitat in the project area? If so, would they be affected by any activities associated with the proposed project?*

   After having completed the Environmental Document and submitting it to Reclamation, DWCCC is not aware of any impacts concerning threatened or endangered species in this area.

3. *Are there wetlands or other surface waters inside the project boundaries that potentially fall under CWA jurisdiction as "waters of the United States?" If so, please describe and estimate any impacts the project may have.*

   After having completed the Environmental Document and submitting it to Reclamation, DWCCC is not aware of any impacts to wetlands in this area.

4. *When was the water delivery system constructed?*

   The canal system was originally constructed in 1884 with concrete liner constructed around 1910 to 1920. Many improvements have been done over the years. As part of the completed environmental document the required historical documentation for the canal was completed.

5. *Will the project result in any modification of or effects to, individual features of an irrigation system (e.g., head gates, canals, or flumes)? If so, state when those features were constructed and describe the nature and timing of any extensive alterations or modifications to those features completed previously.*

This project will replace 2,000 feet of an unlined open canal with 66-inch diameter reinforced concrete pipe (RCP) and will add a 10kW Small hydro turbine in the existing canal. The unlined canal was excavated in the 1920's and is in very bad condition and needs to be piped.

6. *Are any buildings, structures, or features in the irrigation district listed or eligible for listing on the National Register of Historic Places? A cultural resources specialist at your local Reclamation office or the State Historic Preservation Office can assist in answering this question.*

   After having completed the Environmental Document and submitting it to Reclamation, DWCCC is not aware of any building, structures or features that would qualify. A cultural resource inventory was completed as part of the submitted environmental document.

7. *Are there any known archeological sites in the proposed project area?*

   After having completed the Environmental Document and submitting it to Reclamation, DWCCC is not aware of any impacts to or locations of archeological sites.

8. *Will the project have a disproportionately high and adverse effect on low income or minority populations?*

   No. The project would not require a right-of-way or relocations from adjacent properties and would have no impact on residential properties or uses within the study area.

9. *Will the project limit access to and ceremonial use of Indian sacred sites or result in other impacts on tribal lands?*

   No.

10. *Will the project contribute to the introduction, continued existence, or spread of noxious weeds or non-native invasive species known to occur in the area?*

    No. In fact, the project will help with the control of noxious weeds and invasive trees. The projects will allow DWCCC to have better access to the canal for weed control.

Required Permits or Approvals

Applicants must state in the application whether any permits or approvals are required and explain the plan for obtaining such permits or approvals.

A FERC permit will be required for the small hydro turbines as well as a power sales agreement. Documents for the small hydro and power sales agreement have been obtained and information required to complete these has been assembled and submitted with a previous project.

Letters of Project Support

Utah Department of Wildlife Resources Ben Nadolski

GARY R. HERBERT
Governor
GREGORY S. BELL
Lieutenant Governor

State of Utah
DEPARTMENT OF NATURAL RESOURCES
MICHAEL R. STYLER
Executive Director
Division of Wildlife Resources
GREGORY SHEEHAN
Division Director

January 16, 2014

Ivan Ray, Manager
Davis & Weber Counties Canal Company
138 West 1300 North
Sunset, Utah 84015

Subject--U.S. Bureau of Reclamation Water and Energy Efficiency Grant

Dear Mr. Ray:

As an Aquatic Habitat Restoration Biologist for the Utah Division of Wildlife Resources, I am pleased to write in support of the grant application you are submitting to the Bureau of Reclamation Water and Energy Efficiency Grants Program. I applaud your efforts to increase the efficiency of your system to conserve valuable water and energy and to work with your partners to identify the best way to use the water savings as a result of this project. Those savings can be used to benefit flows in the Weber River during critical times of the year.

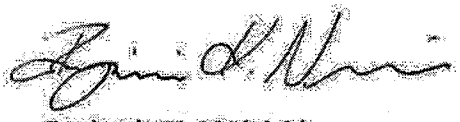
The Bonneville cutthroat trout and the bluehead sucker are native fish species found in portions of the Weber River. Both species are covered by conservation agreements the State of Utah has entered into with the U.S. Fish and Wildlife Service and other parties. The population status of these two sensitive species warrants additional conservation effort to diminish the likelihood of future listings under the Endangered Species Act. The conservation agreements and strategies stipulate how those measures should be implemented.

UDWR's approach to aquatic species conservation and management in the Weber River, in part, focuses on reconnecting and maintaining connectivity of priority habitats by removing unnecessary barriers to fish migration, or by modifying existing barriers to allow upstream movement of these species, particularly for Bonneville cutthroat trout and bluehead sucker. Naturally of course, stable and connecting flows between those habitats are a fundamental requirement for those conservation actions to be successful. Within that context, most any project that enhances the continuity and maintenance of flows within the Weber River is a step in the right direction, as we work cooperatively to protect and conserve these native species.

1594 West North Temple, Suite 2110, PO Box 146301, Salt Lake City, UT 84114-6301
telephone (801) 538-4700 • facsimile (801) 538-4709 • TTY (801) 538-7458 • *www.wildlife.utah.gov*

Thank you for considering the benefits of your actions on these species, and for the opportunity to collaborate with you on this proposal. If you have any questions, please feel free to contact me at (801) 643-4953.

Sincerely,



Benjamin K. Nadolski
Aquatic Habitat Restoration Biologist
Assistant Regional Aquatics Program Manager
UDWR Northern Regional Office

BKN

Official Resolution

The Official Resolution will be submitted by February 23, 2015

Project Budget

Funding Plan and Letters of Commitment

1. *How you will make your contribution to the cost share requirement, such as monetary and/or in-kind contributions and source funds contributed by the applicant (e.g., reserve account, tax revenue, and/or assessments).*

   DWCCC will use money from their own Construction Reserve Account for their contribution. The only in-kind cost which will be included is the cost to prepare the WaterSMART application.

2. *Describe any in-kind costs incurred before the anticipated project start date that you seek to include as project costs. Include: What project expenses have been incurred*

   DWCCC's in-kind expenses include the cost to prepare the WaterSMART application.

   a) *How they benefitted the project*

      Preparations for application included the water loss analysis and mapping to help prepare the WaterSMART application.

   b) *The amount of the expense*

      $ 4,000.00 Grant Preparation

   c) *The date of cost incurrence*

      December 1, 2014 to January 23, 2015

3. *Provide the identity and amount of funding to be provided by funding partners, as well as the required letters of commitment.*

   No letters of commitment will be necessary as all cost sharing will come from the Davis and Weber Counties Canal Company Construction Reserve Account.

4. *Describe any funding requested or received from other Federal partners. Note: other sources of Federal funding may not be counted towards your 50 percent cost share unless otherwise allowed by statute.*

   N/A

5. *Describe any pending funding requests that have not yet been approved, and explain how the project will be affected if such funding is denied.*

No other funding requests have been made. DWCCC already has the funds for their cost-sharing portion for this project.

Funding Sources	Funding Amount
Non-Federal Entities	
Recipient Funding	450,478.00
Non-Federal Subtotal	
Other Federal Entities	
N/A	
Other Federal Subtotal	0.00
Requested Reclamation Funding:	300,000.00
TOTAL PROJECT FUNDING	**750,478.00**

Budget Proposal Funding Group I

Funding Sources	Percent of Total Project Cost	Total Cost by Source
Recipient Funding	60%	$450,478
Reclamation Funding Group I	40%	$300,000
Other Federal Funding	0%	$0.00
TOTALS	100%	$750,478

Budget

Budget Item Description	Computation		Quantity Type	Total Cost
	$/Unit	Quantity		
Salaries & Wages	$0.00	-	-	$0.00
Fringe Benefits	$0.00	-	-	$0.00
Travel	$0.00	-	-	$0.00
Equipment	$0.00	-	-	$0.00
Supplies and materials	$0.00	-	-	$0.00
Contractual /Construction				
Design	$45,367.00	1	LS	$45,367.00
Construction Observation	$45367.00	1	LS	$45,367.00
Mobilization	$20,000.00	1	LS	$20,000.00
Clear and Grub	$8,000.00	1	LS	$8,000.00
66" Class III RCP	$150.00	2000	LF	$300,000.00
Installation	$50.00	2000	LF	$100,000.00
66" RCP Bend	$3,300.00	6	EA	$19,800.00
Imported Structural Backfill	$14.00	3500	TONS	$49,000.00
8' Manhole	$6,000.00	3	EA	$18,000.00
Imported Backfill Material	$14.00	2500	TONS	$35,000.00
Surface Restoration	$4.00	2000	LF	$8,000.00
SWPP Plan	$5,000.00	1	LS	$5,000.00
200 South Bridge demolition	$17,000.00	1	LS	$17,000.00
Imported Sub-base Course	$16.00	500	TONS	$8,000.00
12" Thick Untreated Base Course	$2.50	1600	SF	$4,000.00
4" Thick Asphalt Patch	$3.50	1600	SF	$5,600.00
2" Thick Temporary Asphalt Patch	$3.50	1600	SF	$5,600.00
Remove and Replace Sidewalk	$35.00	60	LF	$2,100.00
Hydropower Generation	$43,000.00	1	EA	$43,000.00
Other				
Reporting	$132.00	32	HR	$4,224.00
Legal	$285.00	12	HR	$3,420.00
Pre-Award Costs – Application Preparation	$ 4,000.00	1	LS	$4,000.00
Total Direct Costs				$750,478.00
Indirect Costs	$0.00	-	-	$0.00
			Total Project Costs	$750,478.00

Budget Narrative

Salaries & Wages

No DWCCC Salaries or Wages will be included. All services will be contracted. DWCCC's staff time will be over and above the cost of the project and will not be counted toward the project cost.

Fringe Benefits

No fringe benefits will be required.

Travel

No travel will be required.

Equipment

Equipment will be part of the contracted portion of the project.

Materials and Supplies

Materials and Supplies will be part of the contracted portion of the project and will be documented as required.

Contractual

In order to determine unit costs which were included in the cost estimate for this project, DWCCC relied upon contract unit prices from a similar project recently completed in 2014.

DWCCC will bid the construction portion of the project to several prequalified construction companies. The contractual costs shown are estimates for each of the components to furnish and install all the equipment. Generally, the low bidder will be selected based on a determination of acceptable qualifications.

Contractual will include design at 7% and construction observation at 7%. The Contractor will be hired to perform mobilization, 2000 feet of RCP 66 inch pipe installation, 6000 tons of imported backfill materials, three 8 foot manholes, perform 2000 feet of surface restoration, demo a bridge, remove and replace sidewalks, patch asphalt and install the, and hydropower generation.

Environmental and Regulatory Compliance Costs

The environmental document for this project was included in a previously completed document and has been submitted for approval by Reclamation. No environmental cost will be included in this project.

Reporting

Reporting costs shown in the application are estimated charges from the project engineer. DWCCC is not requesting any credit or reimbursement for any in-house employee costs for preparing or submitting the necessary reports. DWCCC is contributing their time to the project over and above the required match. Reports will be done by the project engineer for the DWCCC project. **The cost is $4,224.00 and the project engineer has been allowed 32 hours to prepare all the reports at $132.00 per hour.**

Other Expenses

Legal Counsel to review the contracts, power sales agreement, and advice on the bid process for the project is a total of $3,420.00 = 12 hours at $285.00 per hour.

Indirect Costs

No, indirect cost will be part of the project.

Total Costs

DWCCC Portion	Fed Portion	Total
$450,478	$300,000	$750,478


Davis and Weber
Canal Company
Geographic Location Map
Attachment A
D&W Service Area
Roy
Riverdale
Washington
Terrace
South Ogden
Uintah
Hydropower
Location
Sunset
South Weber
Hill Air Force Base
Clearfield
Layton
Canal Enclosure
Project Area
Legend
Canal Enclosure Project Area
Existing Canal
City Boundaries
Feet
0
3,500
7,000
JUB
J-U-B ENGINEERS, INC.
GATEWAY
MAPPING INC.


Davis and Weber
Canal Company
Piping Project Location Map
Attachment B
D&W Service Area
Canal Enclosure
Project Area
Legend
Canal Enclosure Project Area
Existing Canal
City Boundaries
Feet
0
400
800
JUB
J-U-B ENGINEERS, INC.
GATEWAY
MAPPING INC.
2150 NORTH
2000 NORTH
1930 NORTH
1875 NORTH
1850 NORTH
1800 NORTH
1770 NORTH
1720 NORTH
1675 NORTH
1625 NORTH
1525 NORTH
1525 NORTH
10 WEST
5 EAST
50 WEST
75 EAST
150 WEST
60 EAST
75 EAST
125 WEST
25 EAST
100 EAST
150 EAST
175 EAST
200 EAST
225 EAST
230 EAST
300 EAST
EVANS COVE LOOP
CLARK DR
BELVEDERE WY
ARNOLD DR
FORT LN
FAIRFIELD RD
CHURCH ST


Hydropower Location
Existing 3-Phase Power Lines
Existing Meter & Transformer
S CORNIA DR
Davis and Weber Canal Company
Hydropower Project Location Map
Attachment C
D&W Service Area
Salt Lake City
Legend
3 Phase Power Line
Existing Canal
Feet
0
100
200
JUB
J-U-B ENGINEERS, INC.
GATEWAY MAPPING INC.

Attachment D

Chapter 1
Introduction

1-1. Purpose and Scope

This manual provides (a) guidance on the design and construction of conduits, culverts, and pipes, and (b) design procedures for trench/embankment earth loadings, highway loadings, railroad loadings, surface concentrated loadings, and internal/external fluid pressures.

1-2. Applicability

This manual applies to HQUSACE elements and USACE commands, districts, laboratories, and field operating activities having civil works responsibilities.

1-3. References

The references listed in Appendix A contain accepted methods to design conduits, culverts, and pipes which may be used when specific guidance is not provided in this manual. Related publications are also listed in Appendix A.

1-4. Life Cycle Design

a. General. During the design process, selection of materials or products for conduits, culverts, or pipes should be based on engineering requirements and life cycle performance. This balances the need to minimize first costs with the need for reliable long-term performance and reasonable future maintenance costs.

b. Project service life. Economic analysis used as a part of project authorization studies usually calculates costs and benefits projected for a 50- or 75-year project life. However, many USACE projects represent a major infrastructure for the Nation, and will likely remain in service indefinitely. For major infrastructure projects, designers should use a minimum project service life of 100 years when considering life cycle design.

c. Product service life. Products made from different materials or with different protective coatings may exhibit markedly different useful lives. The service life of many products will be less than the project service life, and this must be considered in the life cycle design process. A literature search (Civil Engineering Research Foundation 1992) reported the following information on product service lives for pipe materials. In general, concrete pipe can be expected to provide a product service life approximately two times that of steel or aluminum. However, each project has a unique environment, which may either increase or decrease product service life. Significant factors include soil pH and resistivity, water pH, presence of salts or other corrosive compounds, erosion sediment, and flow velocity. The designer should investigate and document key environmental factors and use them to select an appropriate product service life.

(1) Concrete. Most studies estimated product service life for concrete pipe to be between 70 and 100 years. Of nine state highway departments, three listed the life as 100 years, five states stated between 70 and 100 years, and one state gave 50 years.

(2) Steel. Corrugated steel pipe usually fails due to corrosion of the invert or the exterior of the pipe. Properly applied coatings can extend the product life to at least 50 years for most environments.

(3) Aluminum. Aluminum pipe is usually affected more by soil-side corrosion than by corrosion of the invert. Long-term performance is difficult to predict because of a relatively short history of use, but the designer should not expect a product service life of greater than 50 years.

(4) Plastic. Many different materials fall under the general category of plastic. Each of these materials may have some unique applications where it is suitable or unsuitable. Performance history of plastic pipe is limited. A designer should not expect a product service life of greater than 50 years.

d. Future costs. The analysis should include the cost of initial construction and future costs for maintenance, repair, and replacement over the project service life. Where certain future costs are identical among all options, they will not affect the comparative results and may be excluded from the calculations. For example, costs might be identical for normal operation, inspection, and maintenance. In this case, the only future costs to consider are those for major repairs and replacement. Where replacement will be necessary during the project service life, the designer must include all costs for the replacement activities. This might include significant costs for construction of temporary levees or cofferdams, as well as significant disruptions in normal project operations.

EXECUTIVE SUMMARY

As an important part of the SOR Master Plan for the Davis and Weber Counties Canal Company (DWCCC), J-U-B ENGINEERS, Inc. (J-U-B) has been investigating the hydroelectric power generation potential and financial feasibility for sites along the upper 9-mile segment of the canal system. One site studied was the existing Riverdale Penstocks location. The other "site" studied was not so much a study of a specific "site" as it was a study of a specific emerging hydroelectric technology which could be applied to several sites along the canal. Each case study is described in greater detail within this Report.

For the Riverdale Penstocks site, gross and net head were developed based upon best available elevation data or upon project design data from past canal improvement projects. River flow information was gathered from the USGS Stream Gauging Station at Gateway just a couple of miles upstream from the DWCCC Canal Headworks Structure. The river flow information included daily flow data for the period from 1921 to 2012, with 25th, 50th, 75th and 95th percentile calculations of daily flows for each day of the year. Minimum canal flow requirements were provided by DWCCC records and staff.

Using the calculated maximum canal flow available for power generation for two-week periods at a time throughout the year and the net head available at the site, power generation estimates were calculated.

Once the power generation estimates were calculated for this site, feasibility-level Opinions of Probable Costs were prepared, expected utility rates were identified as published by Rocky Mountain Power Company, and the expected annual gross revenue from power sales was calculated. The gross revenue was then reduced by the estimated annual debt service on a loan to pay 100% of the capital costs of the project and the estimated annual operation and maintenance (O&M) costs for the facility. This resulted in a feasibility-level estimated net revenue for the project and an anticipated return-on-investment period.

The existing Riverdale Penstocks location appears to have excellent hydroelectric power generation feasibility. This seems like an obvious conclusion for a site which functioned as a hydroelectric generation site for Utah Power and Light for several decades. Although there are still a few questions to be answered, the feasibility-level projected net revenue for this site is estimated to be $234,000 per year with a return-on-investment period of approximately 14½ years. While this return-on-investment period may not be short enough to satisfy private energy investors, it does present the positive potential for an additional revenue stream to DWCCC to help offset the power costs throughout their canal system.

The other case study involved the study of micro-hydro power potential along the canal, which is referred to in this report as "Small Hydro and/or Hydrokinetic" power potential. Small Hydro and/or Hydrokinetic power is energy that is available in fast-flowing, open channel water such as rivers and canals. The energy potential increases exponentially as the velocity of the water increases. Thus, faster currents have much more power generating potential.

Following the development of power generation estimates and associated Opinions of Probable Cost, the use of Small Hydro and/or Hydrokinetic generation along the DWCCC Canal does not appear to be a profitable investment. The annual costs for debt service and O&M are estimated to be slightly greater than the estimated annual gross revenue from power generation.

This is an emerging technology. As more and more sites are developed, more manufacturers will become part of the industry and the costs for the equipment will eventually come down. In the meantime, Small Hydro and/or Hydrokinetic power equipment appears to be most applicable to sites with much higher flow velocities than those available on the DWCCC Canal.

It is recommended that DWCCC continue the detailed analysis of the Riverdale Penstocks site with the intent that this site will become a functioning hydroelectric power generation facility, barring any currently unforeseen, insurmountable obstacles.

BACKGROUND

The intent of this Feasibility Report is to evaluate and present the technical, financial, and permitting feasibility for potential hydroelectric power generation along the Davis and Weber Counties Canal Company (DWCCC) canal system in northern Utah.

The canal system for DWCCC originates near the mouth of Weber Canyon near the city of South Weber in Davis County, Utah. The construction of the canal began in Weber Canyon in 1881 by the Central Canal Company. DWCCC was founded in 1884 and took over the construction, operation, maintenance and ownership of the canal from the Central Canal Company. DWCCC has successfully managed the canal up to the present day. DWCCC provides irrigation water for agricultural and residential use in portions of Davis and Weber Counties. Irrigation water for the system is diverted from the Weber River in Weber Canyon and is transported to water users all along its 17.22-mile main canal route.

The two sites included in this study are identified as:

- Existing Riverdale Penstocks Site
- General Sites along the Canal for Small Hydro and/or Hydrokinetic Power Generation

The primary objectives of the Feasibility Study were as follows:

1. Develop a feasibility-level gross head assessment for each site.
2. Research and verify probable annual average river and canal flow rates at each site.
3. Identify permits and agreements that must be completed with the Federal Energy Regulatory Commission (FERC), Rocky Mountain Power (RMP), and other stakeholders.
4. Determine probable penstock size and materials for each site.
5. Evaluate project head-loss for each site and develop estimated net head at the turbine for each site.
6. Size a feasibility-level turbine and generator for each site.
7. Request/obtain equipment cost estimates from reputable manufacturers.
8. Develop feasibility-level opinions of probable cost for each site.
9. Evaluate financing options for the facilities.
10. Develop feasibility-level energy production estimates for each site.
11. Develop revenue expectations given a typical power purchase agreement.
12. Determine a feasibility-level "return-on-investment" period for each site.
13. Compile the above information for each site and provide recommendations.

1. General Sites along the Canal for Small Hydro and/or Hydrokinetic Power Generation

Over the past few years, DWCCC has been learning about other canal companies that have taken advantage of the available head differentials (10 feet or so) at existing drop structures to generate power. In order to use the available potential kinetic energy, the canal companies have piped their canals around the drop structures and run the canal flow through fabricated micro turbines to produce on-site power. It appears that this has proven to be successful where these types of head and flow configurations are available at a drop structures. Unfortunately, the DWCCC canal does not have drop structures like the ones where micro turbines are being used most effectively.

As part of this Feasibility Study, J-U-B was tasked with investigating the micro hydro power potential along the canal. Due to the limited available head along the canal system, J-U-B has studied the possibility of power generation using "Small Hydro and/or Hydrokinetic" power. Small Hydro and/or Hydrokinetic power is energy that is available in fast-flowing, open channel water such as rivers and canals. The energy potential increases exponentially as the velocity of the water increases. Thus, faster currents have much more power generating capabilities.

For much of the information used in this study, J-U-B has relied upon published data from a company named "Hydrovolts" which appears to be one of the current leaders in the development of this emerging technology. Hydrovolts literature includes formulas for calculating the power potential for given site conditions as well as estimated capital costs and maintenance costs for their specific equipment.

Power Potential

J-U-B studied two possible locations for Small Hydro and/or Hydrokinetic power generation along the canal. One location would be inside of the concrete box culvert near the mouth of Weber Canyon where velocities are highest and access to the existing power grid is close by. The second location would be just downstream of the box culvert in the same location, but in the open canal channel. Again, the power grid is easily accessible.

From the Hydrovolts literature, to estimate the power of free flowing water at any site, the following information is needed and calculations performed:

Estimate the cross-sectional Area (A) of the flow in square meters
Estimate the Velocity (V) in meters per second
The Total Stream Power (TSP) in kilowatts = $A \times 0.5 \times V^3$
Generation Power = TSP x 60% (for a general estimate of the power available)

According to Hydrovolts, not more than 15% to 30% of the power in an open stream can be extracted without significantly affecting the whole stream for some distance in the flow. If it is a canal and most of the flow can go through the turbine, the efficiency can reach 60%. We have assumed 60% efficiency in our study.
For the box culvert location where velocities reach 6 feet per second, the Total Stream Power (TSP) is calculated to be 12.5 kW. 60% of that figure yields power generation of 7.5 kW.

For the open channel locations with velocities around 3 feet per second, the Total Stream Power (TSP) is calculated to be 5 kW. 60% of that figure yields power generation of 3.0 kW.

Revenue Annual Power Generation
In order to determine the annual power generation from these sites, we have assumed that the turbines would spin continuously from April 15th through October 15th. This represents 4,320 hours. As noted previously in this study, the rates for avoided cost purchases paid by Rocky Mountain Power for this generated power include $0.0477 per kilowatt-hour for production and $10.35 per kilowatt per month for the generating "capacity" that is available at the site.

Because the only data available from Hydrovolts on the cost for the Small Hydro and/or Hydrokinetic equipment is for a 10kW unit, we have used that size of a turbine/generator in order to determine the estimated annual gross revenue for the most productive site in our study, the box culvert site. For the box culvert site, the estimated gross revenue from power generation is $2,716 per year.

Period	Total Power Output kW	Period Generator Output kWh	Levelized Capacity $10.35 /kW-mont	Energy Price $0.0477 $/kWh
January			$0	$0
February			$0	$0
March			$0	$0
April 16 - April 30	10	3,600		$172
May 1 - May 15	10	3,600	$104	$172
May 16 - May 31	10	3,840		$183
June 1 - June 15	10	3,600	$104	$172
June 16 - June 30	10	3,600		$172
July 1 - July 15	10	3,600	$104	$172
July 16 - July 31	10	3,840		$183
Aug. 1 - Aug. 15	10	3,600	$104	$172
Aug. 16 - Aug. 31	10	3,840		$183
Sept. 1 - Sept. 15	10	3,600	$104	$172
Sept. 16 - Sept. 30	10	3,600		$172
Oct. 1 - Oct. 15	10	3,600	$104	$172
November			$0	$0
December			$0	$0
	Sub-Totals		$621	$2,095
Total Estimated Revenue from Power Sales				**$2,716**

Capital Costs

There are several things to consider in the capital costs associated with a Small Hydro and/or Hydrokinetic power facility. These are listed in the table below, along with assumptions regarding several of the estimated costs. It should be noted that this is for a standalone site. If this is incorporated into a project that has an approved environmental document, the licensing may be much less. Also the FERC and power sales are onetime costs and do not increase if multiple turbines are added.

Item Description	Estimated Cost	Assumption
10kW Turbine-Generator	$ 20,000	Note 1
Site Prep and Unit Installation	$ 1,000	Note 2
Electrical Connection to Grid	$ 3,000	Note 3
Engineering, Legal, Admin and Start-up	$ 4,000	
FERC Licensing	$ 10,000	
Power Sales Agreement	$ 5,000	
TOTAL CAPITAL COSTS	**$43,000**	

Note 1 – Price listed in Hydrovolts literature.
Note 2 – Cable attachments to existing concrete.
Note 3 – Nearby connection to existing power grid.

The up-front investment does not seem to be substantial. Hydrovolts estimates the life of the equipment to be 15 years. Assuming that this investment will be made with DWCCC funds rather than with borrowed funds, the annual cost of the capital investment spread over 15 years is $2,867.

Maintenance Costs

Hydrovolts considers these units to be nearly maintenance-free. They estimate the cost for maintenance to be $1,000 per year.

Summary

Constructing a standalone site may not be cost effective. Small Hydro and/or Hydrokinetic power generation should be considered an addition to other projects that are completed along the canal. Completing the environmental document and permitting with other projects may make the Small Hydro and/or Hydrokinetic power generation much more cost effective and a viable option. Multiple turbines should be considered at the same time to produce more energy for the same permitting costs. Potential grants to assist in the construction and permitting are also available and will increase the return on investment.

As this emerging technology develops, other manufacturers will become part of the industry and the costs for the equipment should come down. Small Hydro and/or Hydrokinetic power generation technology should be monitored to determine when it is appropriate to install on the canal.

Davis & Weber Counties Canal Company
Priority Projects
9/30/2013

High Priority Projects

Priority	Segment #	Stationing Start	Stationing End	Length (ft)	Current Condition	Proposed Improvement	Estimated Replacement Year	Estimated Replacement Cost
1	40	699+00	712+00	1,300	Open Liner	2-66" RCP	2014	$ 911,755.00
2	24	497+00	530+40	3,340	Open Liner	Open Liner	2018	$ 1,763,112.00
3	35	631+75	642+00	1,025	Open Liner	3-66" RCP	2020	$ 973,999.00
4	49	852+40	873+75	2,135	No Liner	1-66" RCP	2023	$ 1,008,709.00
5	50	873+75	891+00	1,725	No Liner	1-66" RCP	2025	$ 823,608.50
6	46	756+75	788+25	3,150	No Liner	2-66" RCP	2031	$ 2,141,347.00
7	47	788+25	800+00	1,175	No Liner	1-66" RCP	2032	$ 577,759.00
8	43	725+50	742+50	1,700	Open Liner	2-66" RCP	2035	$ 1,219,491.00
9	42	714+25	725+50	1,125	Open Liner	2-66" RCP	2037	$ 756,606.50
10	33	619+75	630+25	1,050	Open Liner	3-66" RCP	2039	$ 957,489.00
11	30	604+75	611+25	650	1993 Liner	3-66" RCP	2041	$ 743,392.00
12	29	601+25	604+75	350	1993 Liner	Open Liner	2042	$ 193,700.00
13	27	590+50	593+75	325	Open Liner	Box Culvert	2042	$ 352,872.00
14	25	530+40	585+00	5,460	Open Liner	Open Liner	2046	$ 2,850,068.00
15	45	743+50	756+75	1,325	84" Steel	2-66" RCP	2047	$ 911,755.00
16	52	90130	90375	245	Open Ditch	1-48" RCP	2048	$ 80,028.00
							Total	$ 16,265,691.00

Project is a Portion of Both

Watch List

Priority	Segment #	Stationing Start	Stationing End	Length (ft)	Current Condition	Proposed Improvement	Estimated Replacement Year	Estimated Replacement Cost
17	8	140+84	144+68	384	1998 Open Liner	Open Liner	2038	$ 210,319.20
18	18	335+00	352+40	1,740	1995 Open Liner	Open Liner	2035	$ 960,232.00
19	14	282+25	293+80	1,155	1993 Open Liner	Open Liner	2033	$ 678,184.00
20	20	374+75	392+00	1,725	1992 Open Liner	Open Liner	2032	$ 945,100.00
21	23	471+00	497+00	2,600	1988 Open Liner	Open Liner	2050	$ 1,401,400.00
22	31	611+25	615+00	375	3-60" Aluminized Steel Pipes	3-66" RCP	2040	$ 361,296.00
23	37	643+00	652+00	900	2011 Open Liner	3-66" RCP	2052	$ 822,198.00
24	38	652+00	666+75	1,475	1988 Open Liner	3-66" RCP, 2-66" RCP	2055	$ 1,414,055.50
25	48	800+00	852+40	5,240	2000 54" CMP and RCP	1-66" RCP	2060	$ 2,470,403.00
							Total	$ 9,263,187.70

Attachment F

PROPOSED CANAL IMPROVEMENTS

Based on the water model and the needs of each segment of the canal, a list of current infrastructure conditions and projects has been generated. This table assumes the life of concrete liner is 40 years and the life of pipe/box culverts is 80 years. This is longer than the typical 30-year life expectancy of concrete liner and 50-year life for most pipes and box culverts. These timelines are only estimates and will vary depending upon construction techniques, maintenance activities, exposure to the elements, abrasion, root intrusion, freeze/thaw conditions, etc.

Projects that have been completed on the canal since 1999 do not have replacement cost estimates associated with them. However, the cost for installation when the improvements were installed is shown in the table. These projects should have at least a 30-year design life. Given the current replacement needs on the canal system, and anticipated available funding, definitive planning for replacement of those recently installed improvements was not considered feasible at this time. The total costs incurred from 1999 to 2012 for these recent replacements could be used to establish a template for future replacement costs.

The Overall Canal System Summary showing the stationing, flow rates, existing conditions, proposed canal improvements, and construction costs for each segment is contained in Appendix E. Maps showing the Long Term Plan are contained in Appendix I.

PROJECT PRIORITIES

The project segments have been prioritized based on the hydraulic model, visual inspections, DWCCC staff, and current conditions. These priority projects were broken down into two groups:

1. High Priorities List: This list consists of projects that are considered to be possible safety concerns, indicate high losses of water, or are so deteriorated that replacement is the only option. The order for the high priorities list should be reviewed regularly, at least annually. Projects may move up the list in importance based on adjacent development along the canal, maintenance of vegetation, ability to clean, energy development opportunities, better conservation, prevention of water seepage, protection of the environment, and other factors.

2. Watch List: The watch list consists of projects that will be needed either when the existing facilities have reached the end of their useful life, which may be out 30 years or longer, or when extra capacity in the canal is needed. Within the projects on this list there are several segments with aging concrete liner that are currently in satisfactory condition. The watch list will be evaluated on a bi-yearly basis to document deterioration, seepage losses, and hillside or slope movement along the canal and if needed the projects could be moved to the priorities list.

The Project Priorities List showing the High Priorities List and Watch List is contained in Appendix F. A detailed Engineer's Opinion of Probable Cost for each segment on the Project Priorities is included in Appendix G.

Funding

The projected construction years set with each project are based on DWCCC being able to fund an average of $400,000 per year for infrastructure replacements. This funding would consist of funds collected from assessments, loans, private partnership participation, or grants. DWCCC will continue to seek grants wherever possible to complete the projects on the priorities list. If future evaluation of the condition of facilities indicates that the anticipated time frames are not going to provide needed service, funding will need to be increased. Additionally, already completed improvements should be depreciated and funding established for their eventual replacement.

WATER SAVINGS

Based on the system water loss information collected in 2012 approximately 3,500 acre-feet of water would be conserved by completing the projects identified in the Master Plan.

SCADA SYSTEM

Since 2005 DWCCC has been upgrading and installing their SCADA system. The central components and systems are maintained and updated as needed. As new meters are installed on main canal gates, a SCADA PLC panel should be installed and connected to the system. These new panels have been addressed as part of the Priority Project List and costs are included with the meters and/or turnouts.

HYDROPOWER GENERATION

A feasibility study has been completed to evaluate possible locations for power generation along the canal. Two scenarios for hydropower were identified and evaluated. The first scenario involved a specific site that would create a 1.3 megawatt hydropower plant at an existing penstock location in Riverdale. The second scenario involved multiple locations along the canal that investigated the feasibility for creating power using low head turbines in the main canal and box culverts. The feasibility study for the hydropower is attached in Appendix H.

MASTER PLAN UPDATES

As part of DWCCC's commitment to water conservation and safe operation of their facilities through developed communities within their service area this report will be updated approximately every 5 years. As projects are completed and as conditions change along the canal the priority projects and rankings will be evaluated and revised. Cost estimates will be updated approximately every 5 years or as needed to ensure that costs are reflecting actual construction costs for planning and projection purposes. Projects will be evaluated to determine if any additional concerns need to be addressed as part of the project and of the overall system's efficiency.

Impacts or Constraints – There are no adverse impacts or constraints to implementing this measure (working closely with Reclamation during the remediation process). All impacts from the actual Safety of Dams remediation will be addressed and evaluated as part of the process and are therefore not included in this analysis. *EI: "None", L&IC: "None"*

Goal 5 – Support Upgrade of Non-Association Facilities

As described in Section 2, all Project water is diverted through privately owned conveyance facilities. The conveyance facilities that divert water directly from the Weber River are the Davis & Weber, Gateway, Hooper, Uintah Central, Pioneer, Riverdale Bench, Wilson, Plain City, South Slaterville, and Warren Canals. Other canals in Weber, Morgan, and Summit Counties receive Project water by exchange. Even though the Association does not own or operate any of these facilities, they are very supportive of efforts to maintain and upgrade the facilities to improve their ability to safely and efficiently convey Association water to the end users.

CM 9 – Support the Upgrade of Davis & Weber Canal Facilities

A "Capital Improvement Plan" was prepared by DWCCC in 1999 for the approximate 9.1-mile reach of the D&W Canal from its headworks on the Weber River to the Roy Water Conservancy Subdistrict in Riverdale, Utah. This plan has been updated several times since that time to reflect work completed and modifications made to the previous version of the plan. To date, approximately 7.6 miles of this section of original canal liner has been replaced leaving a balance of about 1.5 miles of original canal.

Based on the current plan, additional improvements to this section of the canal would include a complete reconstruction of the headworks and forebay, replacing approximately 4,000 feet of original concrete lined canal with box culvert, replacing approximately 4,000 feet of reinforced concrete trapezoidal liner with water stop, and resealing joints and making roadway improvements to the remaining approximately 6.6 miles of canal. The project also includes installing remote monitoring and telemetry equipment to automate portions of the canal, monitor flow rates, and monitor other crucial elements of the canal. Construction would take place from now through the year 2018, at a total cost, based on 2008 dollars, of about $18 million.

Work contemplated in the next three years includes replacing the 4,000 feet of canal with box culvert at a cost of about $3,600,000, replacing the 4,000 feet of canal with reinforced concrete liner with water stop at a cost of about $1,600,000, and reconstructing the headworks and forbay for an additional cost of about $6,000,000.

This candidate measure consists of the Association cooperating with DWCCC to complete the rehabilitation of the canal. DWCCC would fund the work with the Association working closely to ensure Association interests are protected.

Projected Benefits – The primary objectives of the project are to improve the safety of the structure, conserve water by reducing seepage losses, and provide for more efficient operation and maintenance. Significant residential development has occurred adjacent to the canal in

recent years. The July 11, 1999 failure of a section of the canal caused significant damage down-slope of the canal and heightened the concern of area residents and the DWCCC Board of Directors. DWCCC has aggressively worked since that time to ensure the canal is safe and that additional failure does not occur. Implementation of the measure would increase safety of the structure, reduce DWCCC liability, reduce operation and maintenance costs, and reduce water loss from seepage. *WCE: "Moderate", O&M: "Minor", S&L: "Substantial"*

Costs – The project would be funded through loans from the Board of Water Resources and from DWCCC shareholder assessments. Costs to the Association for staff time and other requested assistance is considered negligible.

Impacts or Constraints – Implementation requires that a feasibility report be prepared and submitted to the State of Utah for review and approval prior to funding authorization. An environmental analysis is required as part of the feasibility report. Compliance with other applicable federal, state, and local laws is also required. *EI: "Moderate", L&IC: "Minor"*

Goal 6 – Protect and Maximize Use of Water Rights for Beneficial Use

Protecting and maximizing the use of Association water rights has always been a primary focus for the Association. The accelerated population growth in the area together with changing environmental laws and regulations pose a risk to Association water rights. In order to protect Project water rights as well as achieve the greatest benefit for shareholders and the public, the Association must be willing to adapt to the changing conditions. The Association has identified the following measures that if implemented would help achieve this goal.

CM 10 – Encourage and Support the Construction of Feasible Secondary Irrigation Systems

As land use changes from agriculture to residential, demands for Project water shift from commercial agriculture to irrigation of lawns and gardens. The Association, in conjunction with DWCCC, has developed a program to assist municipalities in converting water use for agriculture to municipal irrigation uses, where feasible, by developing secondary irrigation systems. This program has been very successful in the past. A list of existing secondary irrigation systems is shown in Table 5-1. The Association and DWCCC would like to continue the program into the future. This candidate measure consists of the Association and DWCCC assisting municipalities and others through the planning, construction, and startup phases of new secondary irrigation system development. This assistance comes in the form of technical consultation, helping with preparation and execution of the necessary agreements, and educating entities through presentations and distribution of information.

Projected Benefits – Secondary irrigation systems provide three main benefits. First and foremost, they provide better water distribution control and hence provide water savings. The quantification process associated with secondary systems reduces the water needed for the property by excluding the hard, non-irrigable surfaces such as roof tops, driveways, streets, and business parking lots from the calculated need. The city therefore only takes a portion of the irrigation right associated with the land and the remainder becomes available for beneficial use within the cities for parks, cemeteries, schools, churches, etc. Second, it provides a good source