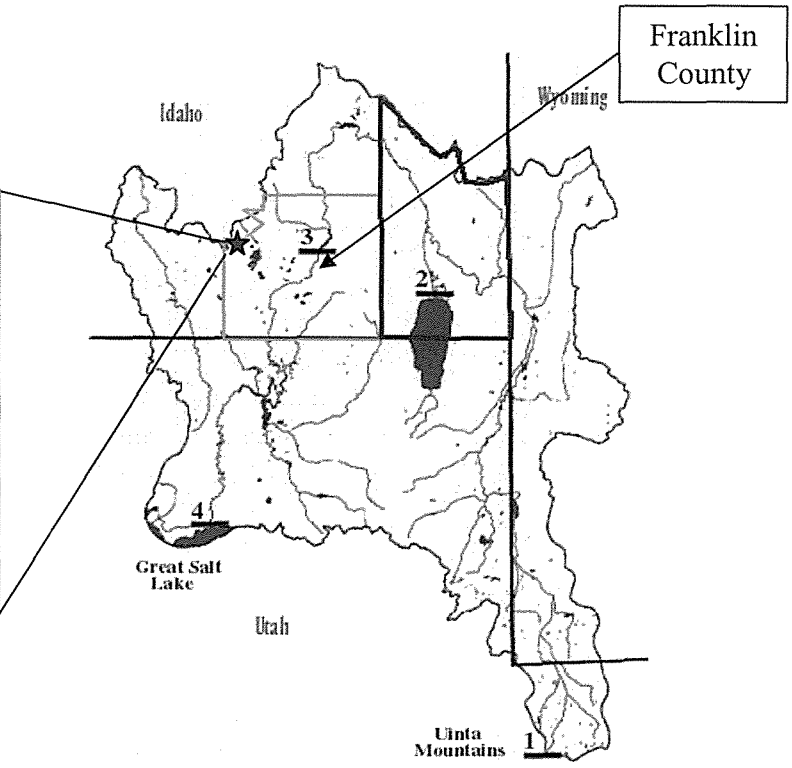
WaterSMART(Sustain and Manage America's Resources for Tomorrow)
Water and Energy Efficiency Grants for Fiscal Year 2013
Funding Opportunity Announcement No. R14AS00001

Innovative Energy Production coupled with Irrigation Efficiencies for Oxford Reservoir and Irrigation Franklin County, Idaho



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January 19, 2014

Title Page

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Executive Summary

Date: January 19, 2014

Applicant: Oxford Reservoir and Irrigation Company
City: Clifton County: Franklin State: Idaho
Length of time: 2 years Estimated completion date: September 30, 2016

Increasing demands from industry, recreational interests, rural to urban conversion, and agriculture are creating potential water crises and placing pressures on water, a very important and limited natural resource. The greater the demand, the greater the need for water users to use and share available water wisely. How can a user practice good management unless he knows the amount of water involved? How can the regulatory agencies complete their duties without knowing the amount of water diverted? Accurate measurement of water is the basis of good water management. But is management enough, do we need system improvements? Traditionally, irrigation system improvements have focused on the on-farm improvements. It is time to commit this same focus on the conveyance networks. A combination of both coupled with accurate measurement is necessary to achieve the highest efficiency.

Farming has undergone fundamental changes in recent years that have resulted in many farmers leaving the farm entirely or relying on off-farm employment. Farmers in the Bear River Basin who have survived have done so by becoming adept at increasing efficiency and productivity. As stated in the Bear River Basin Cooperative study completed in 1978 conveyance improvements "could be made by lining canals thought high seepage area, piping canals through high failure hazard area, constructing diversion dams at canal headings, and providing adequate control structures and measuring devices. (USDA-SCS and Forest Service, 1978)

Thirty six years later we still consider these problems associated with water in the Bear River Basin. Implementation of efficiency improvements are stalled in general because Bear River farmers cannot afford to pay the full development cost of water improvement projects without financial subsidies or other incentives.

To successfully accomplish the goal of sustainability, planning and foresight must be coupled with support of all stakeholders and the resources they can provide. Funding will include integration of programs. Leveraging of federal, state, and local funds and incentives allows for larger projects to be completed without depleting the funds of any one entity, yet giving the benefits of the whole project back to all involved.

The action plan improves the sustainability of the Oxford Reservoir and Irrigation Company by saving water and better managing existing irrigation water. This project exemplifies Locally Led Conservation. It is based on the principle that community stakeholders are best suited to deal with natural resources problems. This irrigation company has evaluated options, implemented projects, and is committed to taking one step at a time to reach the ultimate goal of a highly efficient system that is also cost effective to its shareholders.

At this point in our planning process we are requesting Reclamation's assistance to implement a systematic plan with overall solid goals. This project is based on the Guidebook for Preparing Agricultural Water Conservation Plans. We will or have followed the following steps: 1. Gather information and define problems 2. Set goals and priorities 3. Evaluate options 4. Define a plan of action 5. Implement plan 6. Monitor for progress.

Once the basic issues and problems were identified and understood, goals were defined and prioritized in order to facilitate scheduling and management strategies. Based on a systematic prioritization process the key issues of seepage losses and accurate measurement were identified by the irrigation company. The energy currently being released to atmosphere to facilitate pressure reduction could have economic potentials for on farm use.

The Irrigation Company board of directors analyzes projects based on the water savings to the entire company and the benefits provided to the stockholders in a specific lateral. The company has prioritized this project as number one for future improvements. Water savings generated by this project will produce additional water throughout the service area. Because the shareholders are inherently conservationists, they wish to complete a project with minimal environmental impact and hope to provide benefits to the fish and wildlife habitat provided by the Oxford Reservoir.

Performance Measure A-Quantifiable Water Conservation
First and foremost the water losses occur from seepage, distribution failure, operational waste, on-farm technology, and evaporation in the earthen ditch. This water loss estimation is based on the amount of water that is conducted through the open ditch, held in storage in the reservoirs, and finally arrives at farms. It takes into account the soil types, the amount of water, and the duration the water is in the ditches. This project will replace 4.5 miles of un-lined, earthen canals located in gravelly soils with 21,740 feet or 4.1 miles of 100 psi, PIP plastic pipe.

Proper implementation of agriculture water-use efficiency typically provides increases in crop yields of 15-30 percent. Assuming that 3 crops of alfalfa hay instead of 2 crops are produced per season, at a production rate of 1 ton per crop per acre - and at a net value of $35 per ton –the service area of 380 acres would generate an additional $13,300.

The irrigation company will manage the water better by installing adequate measuring devices at each service connection. This metering method will consist of an inline master meters and magnetic type meters at the point of delivery. These meters will be used to confirm the amount of water use.

The proposed project would result in a quantitative annual water savings of 1,080.31 acre-feet per year and a qualitative benefit of reducing the leaching of nutrients, the transport of noxious weeds, and the sedimentation loading of the reservoir due to soil erosion.

Performance Measure B- Quantifiable Energy Conservation
Renewable energy generates a range of benefits at the local, state, regional, national, and global levels. It uses natural resources, reduces greenhouse gas emissions, and reduces U.S. dependence on foreign energy sources. Renewable energy can also furnish long-term price stability as they rarely depend on costly fuel sources. (Dept of EERE, July 2011)

By using an Environmental Impact calculator provided by Rocky Mountain Power our project that produces 42,000 kilowatt hours offsets 52,438 lbs of CO_2. This is equivalent to planting 616 trees.

Performance Measure C- Critical Habitat, T&E
The benefits of this project make this a favorable project. This pipeline portion makes a very small if any impact on the environment. This is substantially offset by increased water levels in the reservoir for water fowl and agricultural improvements in the uplands for grouse and other terrestrial animals.

Water will be used more efficient out of Oxford Creek to help address the lack of water on the Oxford Slough WPA. The Oxford Slough WPA is currently updating their management plan to help create better habitat for migratory species. The Oxford Reservoir company will take part in the planning process.

The project is located in the Preston-Cache Valley nitrate priority area #20. The resulting irrigation improvements will reduce the leaching of nutrients, pesticides, and fertilizers from the cropland. These benefits will result in cleaner ground water, which in turn will provide cleaner well water. Canadian thistle, dyers woad, and leafy spurge, are the main noxious weeds found in the vicinity of the canal. This pipeline would eliminate their environment and stop the spread of their seeds downstream.

Performance Measure D-Water Markets
Based on a consumptive use requirement of 3 acre-feet per acre, and given a total service area of 380 acres, approximately 1,140 AF is needed for optimized crop production. An assumed 456 AF (approximately 40% of consumptive use) is available from precipitation and ground water. This yields an estimated 684 AF. Water is diverted from streams, and approximately 64% is lost due to seepage. By installing the proposed pipeline, 1,080 AF will be conserved and made available to make up the consumptive use deficit, and 396 AF will then be available for water marketing or habitat improvement.

We will hold an exploration and development seminar on Water Banking in an irrigation district, and/or watershed for the water managers. We will provide a panel of experts and agencies to facilitate discussion and questions & answers. Water managers will learn about tools and techniques with an emphasis on water banking which will benefit the environmental, the farmer, and most important provide an alternative to the conflict and tension over future water supplies.

In summary the Oxford Reservoir and Irrigation Company has unique problems that result in a loss of water through various methods. As good stewards of the land any improvements must also benefit fish and wildlife habitat. A logical process that used science and technology to remedy the efficiency deficiency in a cost effective, environmental sensitive way is beginning. To define a plan of action we propose a pipeline project coupled with installation of measuring devices at the connection. In addition we will support the Administration's strategy to develop environmentally responsible renewable energy by producing energy captured from existing excess pressures and convert this to use in a hydraulic center pivot with a micro-hydro turbine. The grant of $298,000.00 will leverage a $598,644.46 project. This will result in 1,080.31 acre feet of water saved, 1,528.96 acre feet of water better managed, and 42,000 kilowatt hours produced.

Background Data

When the settlers first came to this area in the late 1800's the first projects they begun were irrigation. They knew that our arid climate would not generate productive farmland without irrigation. Irrigation companies continue what the settlers began. Their goals have always been to effectively use the water available without waste or abuse to promote the desired crop response. The stockholders associated with this project realize that new technology combined with planning can make their irrigation system more efficient and provide sustainability without affecting the non-replaceable natural resources.

Over the years the Natural Resources Conservation Service (NRCS) has been instrumental in producing studies for various irrigation entities. These plans provide different levels of engineering and design but have a common thread. That is to investigate the related problems and propose solutions to conserve the natural resources.

A reconnaissance level inventory of irrigation conveyance systems in the Bear River Basin was conducted in 1973 and 1974. The systems were evaluated according to irrigation efficiencies, area served, water source, condition of canals and structures, and method of delivery. The related problems of seepage losses, sedimentation, and floodwater damages were studied. Potential solutions included lining, new structures, and storage reservoirs. (USDA_SCS, April 1976)

The summary of the working paper compiled in 1976 stated that "there are 400 irrigation companies serving 474,700 acres of irrigated land. The overall condition of canals was identified as fair. The overall efficiency was 26 percent with a conveyance efficiency of 66 percent and on-farm application efficiency of 40 percent. Additional water can be obtained by increasing efficiency both in conveyance and on-farm systems". (USDA_SCS, April 1976) Shortly after this the focus became increasing on-farm efficiencies by utilizing sprinkler systems instead of flooding techniques. When on-farm improvements and management involving simple cooperative water operating agreements do not provide the needed water efficiencies then the next step is necessary. Conveyance improvements such as this opportunity presented by the WaterSMART are the next step.

The Obama Administration's has a goal to double energy productivity by 2030 and help communities save on energy bills by boosting the energy efficiency of public institutions, local governments and industrial sectors. "Smart, cost-effective investments in energy efficiency are helping communities across the country cut energy waste and foster economic growth," said Assistant Secretary for Energy Efficiency and Renewable Energy David Danielson. (DOE, Dec. 2013)

(a) Information Gathered

The Oxford Reservoir and Irrigation Company's purpose is to "buy and sell, own, hold and lease farm lands, water rights, canals, ditches and reservoirs, and to construct and operate canals, ditches, reservoirs, and systems of irrigation, and to hold all rights of real and personal property franchises and privileges, necessary, proper or convenient in carry on the purpose of this corporation." (Oxford Reservoir and Irrigation Company Article of Incorporation, (February 24, 1949)

This corporation has been formed as an irrigation corporation, and" heretofore operated and conducted solely on the co-operative plan, for the purpose of acquiring and holding water rights and

water works for the use of its stockholders, and for the purpose of delivering such water of the corporation to its stockholders for agricultural and other useful purposes, it shall be the duty of the board of directors and all other officers of said corporation to continue and conduct said corporation as a co-operative irrigation corporation, solely for the benefit of its stockholders in the distribution of the water belonging to said corporation, and not for pecuniary profit; and for the purpose, each and every stockholder of said corporation is entitled to receive from said corporation, such part of the waters flowing through its ditches and canals as the number of shares of capital stock owned by each shareholder, shall bear to the total number of shares of the issued capital stock of the said corporation; subject, however, to such reasonable rules and regulations for the delivery thereof, as the board of directors shall make and adopt. (Oxford Reservoir and Irrigation Company bylaws, February, 1949) It is the responsibility of the water master to implement the board of directors' decisions.

The system includes North Oxford Creek ditch, Gooseberry Creek ditch, 4 laterals, and the storage reservoir known as Oxford Reservoir. The service area is located north, south, and west of the Reservoir (see attached Water Right). Gooseberry creek water is diverted and is transported 2.5 miles to the Oxford reservoir. Additional water is diverted from the oxford creek and travels 2 miles in the North Oxford Creek ditch around the point of the mountain to Oxford Reservoir, where a diversion box splits the water and it is deliver to shareholders via the Lateral ditches.. All of the 381 acres of the service area is located below the reservoir. Oxford Reservoir and Irrigation Company has 4 shareholders and irrigate 381 acres. Water rights include surface rights 13-2067 from Oxford Creek, its springs, and tributaries. Additional surface rights are with 13-2001 from Gooseberry Creek, its springs, and tributaries. Storage is permitted under National Dam ID ID00173 for 300 acre feet annually.

Major crops grown are small grains, pasture, and alfalfa. Specifics associated with the crops irrigated along the Bear River are: Potatoes 2%, Alfalfa 35%, Meadow hay 4%, Pasture 18%, Spring wheat 6%, Winter wheat 15%, Spring barley 12%, Sugar beets 1%, Corn 6%, Other 1% (Hill, Robert et al., 1989)

During the average growing season May-September limited precipitation is available for crop production. Direct use of ground water by the crops is an integral part of the present consumptive use. Within this service area, the Soil Conservation Service (SCS) estimated that 25-50 percent of the crop's needs come from precipitation and ground water. (Taylor, Leroy P.E., Sept., 1980). Thus irrigation and irrigation water storage is necessary for the crops in this system.

(b) Problems Defined

Uncontrollable issues, such as the increase in population and the drought cycle make the old and aging technology implemented during the pioneer days a real liability to the conservation of water and the efficiencies of irrigation systems.

This project will address the following:
Water Seepage Losses... The project site is located in gravelly silt loam (Cloudless hades), gravelly stone silt loam (Cloudless Hades Howcan), Cobbly silt loam (Yeates Hollow-Manila) silty clay loam (Oxford-Banida), Cobbly gravelly silt loam (Hondoho-hades), and Gravelly silt loam (Hades-Lanoak). Water loss is most prevalent in the cobbly gravelly silt loam (see attached soils map). Due to these soil types the irrigation ditch loses 59-69% of its water to seepage.

Water Evaporation Losses... In our climate construction of irrigation ditches avoided the north slopes due to the timing of the snow removal in the spring. This creates the prime conditions necessary to facilitate evaporation from these ditches during the warm summer months.

Distribution Losses... The stockholders currently use both flood and sprinkler irrigation techniques. Flood irrigation has a proven 30-35% efficiency rate and limits the reach of the water. Sprinkler has a proven 60-65% efficiency rate and allows for the best distribution of the water to the crop.

Water budget data for the neighboring Preston Riverdale, Mink Creek Irrigation Company demonstrated farm efficiencies of 65%. This illustrated that in a similar sprinkler dominant system farm efficiencies are lowest in the early season when the supplies are the highest. The irrigators need education on using crop requirement data to schedule irrigation deliveries to conserve early-season flows for later in the season. Along with the undesirable loss of water, the low farm efficiencies during the highest water supplies suggest the potential for soil erosion and nutrient leaching exists. These conditions have a detrimental effect on ground and surface water quality.

Accurate measurement... In this system the delivery to farm or subsystems is not accurately measured or permanently recorded. The water use estimates are based on number of sprinkler heads and customary usage times. Stockholders cannot match deliveries to crop requirements. The irregularity in water delivery makes it impossible for the producer to make key production decision on such things as fertility management and variety selection.

Ground Water... This seepage raises the water table in the surrounding area and elevates many problems associated with a high water table. This high water table influences the efficiency of septic systems in the area. It causes flooding in basements and dictates the construction time line for many projects. These concerns are growing more important as the Clifton area becomes more urbanized. By reducing the seepage from the canal the water table would be reduced to a manageable level and alleviate many of these urban concerns.

The project is located in the Preston/Cache Valley nitrate priority area #20. Reduced canal loss seepage would benefit this. The resulting irrigation improvements will reduce the leaching of nutrients, pesticides, and fertilizers from the cropland. These benefits will result in cleaner ground water, which in turn will provide cleaner well water.

Fish & Wildlife Habitat... The land in the Bear River corridor contains wetlands, floodplains, and riparian habitats vital to the protection and sustainability of wildlife populations. The riverine habitat includes Native Sport Fish such as the Bonneville Cutthroat Trout, a federally designated Globally-imperiled species. The riparian areas provides habitat for Neotropical songbirds species such as the Federally Protected Morning Dove. The adjacent agricultural land contains transitional and winter range for Mule Deer, a species of local and regional importance and upland pheasants and grouses such as the State Species of Concern Sharptail Grouse.

Russian Olive and to a lesser degree Tamarisk trees are displacing desirable native riparian and wetland pants in the riparian area and adjacent agricultural lands. Removing this monoculture and replacing them with a variety of native plants would provide better habitat in the streams and rivers

for the trout species and provide a native over story canopy for migratory birds instead of hosting undesirable species.

Ensuring the sustainability of the only Waterfowl Production Area (WPA) located in Region 1 of U.S Fish & Wildlife Service Refuges is a primary goal of this neighboring landowner who shares the same watershed as our project. Thousands of waterfowl utilize Oxford Slough WPA during spring migration. Irrigation demands have significantly reduced water holding capacities on the Oxford Slough WPA, which shows a tendency to become desiccated prior to recruitment by summer produced waterbirds leaving the slough dry when fledglings need it most. (Bundy, Rob U.S. Fish & Wildlife Services, January 2005)

Similar issues carry over from the Oxford Slough WPA to the Oxford Reservoir where the lack of water available limits the amount of shore bird habitat for species such as white-faced Ibis, Long billed Curlews and other waterfowl species. More efficient water use would create better habitat. Hunter Moyles, President is also a Habitat Biologist. He states that "many different shore birds, and waterfowl would use the open water if we could create a more efficient watering system. I am also installing a Riparian forest buffer and have kept cattle out of the reservoir to create better nesting habitat for upland birds". (Moyles, Hunter, 2014)

Erosion... Soil erosion by water affects both agricultural areas and the natural environment. It impacts both the canal by down cutting and the reservoirs where the eroded soil ends up. This reduces the capacity of the irrigation reservoir.

On Farm Energy Use... Pressurizing the on-farm sprinkler system requires pumping. Rocky Mountain Power has placed the order of energy use as Big Industrial (Monsanto), Industrial, Irrigation, Business, and Residential. A Reduction in irrigation use would allow electrical energy to be more abundantly available for other uses. Repairs on booster pumps would be scaled back because of less usage. As seen in figure 1 all energy cost have escalated and are projected to continue to rise.

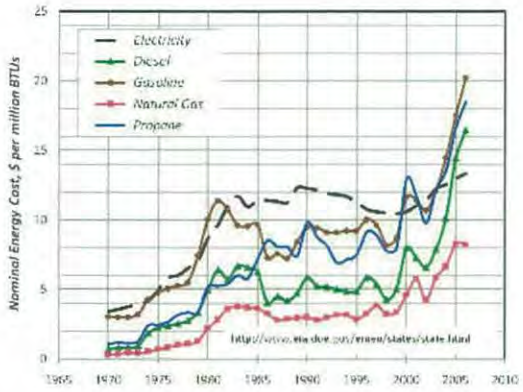
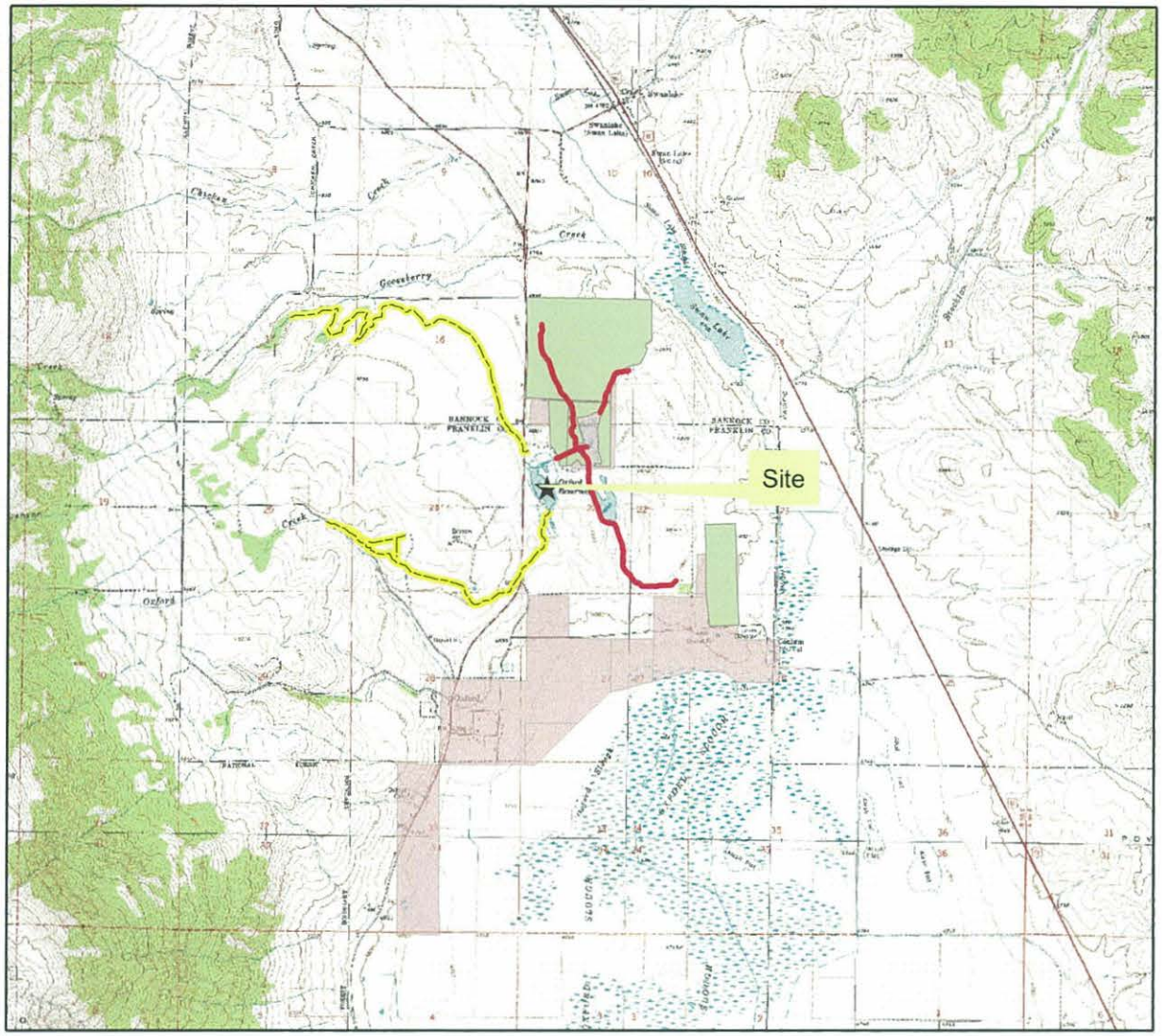


Figure 1. Historical energy prices since 1970

Safety... The Oxford Ditch can carry 3.2 cfs and the four laterals carry 12.8 cfs. These canals are in close proximately to residential areas. Children and animals are drawn to water sometimes with potential disastrous results. By placing this canal in underground pipe the opportunity for a tragic accident is removed. Placing the canal in underground pipe would also remove the potential for a breakage. Canal breaks wash out property and create costly repairs in urban developments.

Noxious Weeds... Canadian thistle, dyers woad, leafy spurge, and water hemlock are the main noxious weeds found in the vicinity of the canal. This pipeline would eliminate their environment and stop the spread of their seeds downstream.

Oxford Reservoir and Irrigation Company Project



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USGS Quadrangle: Oxford, Swan Lake Idaho

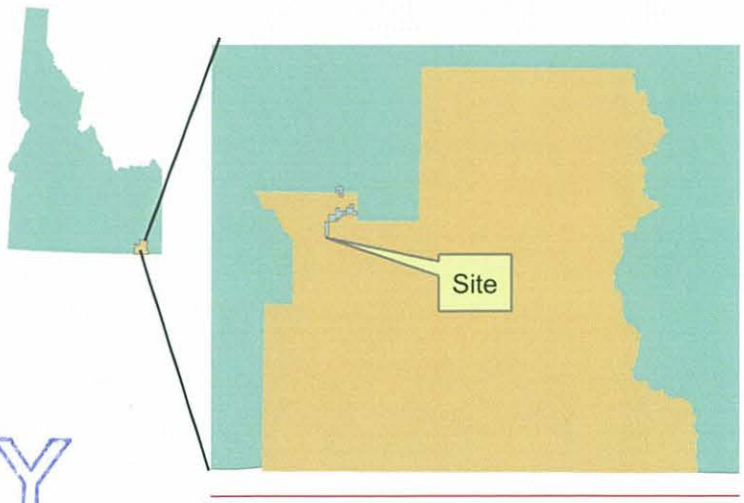
Township 13 South Range 38 East Sections 20, 29

0 1,9003,800 7,600 11,400 15,200 Feet

N

Legend

- Wood Lateral
- Yearsley Lateral
- Combe Lateral
- Moyles Lateral
- Gooseberry Ditch
- Oxford Ditch
- Oxford Irr Service Area
- water_right_area_IDWR



Watershed Conflicts... The 2010 census ranks states by growth rate. From 2000 to 2010 the five fastest growing states in the nation are: 1) Nevada (35%), 2) Arizona (24%), 3) Utah (23%), 4) Idaho (21%), and 5) Texas (20%).

Even in our rural communities, the population has increased. A futures study completed by the Utah State University, Department of Landscape Architecture and Environment Design for the Cub River Watershed showed a 2.5 growth rate in 1999 and projected population to double in 20-25 years (Toth et al, 1999).

Additional concerns such as urban encroachment, ditch and reservoir maintenance, loss of cropland or the ability to utilize pivot technology due to open ditches, and the reduction in capacity generated by existing road crossings justify this project.

Technical Project Description

(a) Goals and Priorities

Once the basic issues and problems were identified and understood, goals were defined and prioritized in order to facilitate scheduling and management strategies. Based on a systematic prioritization process the key issues of seepage losses and accurate measurement were identified by the irrigation company. The energy currently being released to atmosphere to facilitate pressure reduction could have economic potentials for on farm use.

The Irrigation Company board of directors analyzes projects based on the water savings to the entire company and the benefits provided to the stockholders in a specific lateral. The company has prioritized this project as number one for future improvements. Water savings generated by this project will produce additional water throughout the service area. Because the shareholders are inherently conservationists, they wish to complete a project with minimal environmental impact and hope to provide benefits to the fish and wildlife habitat provided by the Oxford Reservoir.

(b) Evaluate Options

Upon completion of a preliminary water conservation plan and hydraulic study several alternatives including both management and technology measures are available to the irrigators. Only a few of these measures however have the capacity to accomplish the specific goals. In identifying alternatives, special attention was given to measures other irrigators were currently employing. In instances where an alternative has proven to be ineffective in resolving 100% of a specific issue, the measure was not considered for evaluation.

The Oxford Reservoir and Irrigation Company has unique problems that result in a loss of water through various methods. A logical process that used science and technology to remedy the efficiency deficiency in a cost effective way is just beginning for this company. To define a plan of action we propose a pipeline project coupled with installation of measuring devices at the connection. More efficient use of water will create better shorebird habitat and nesting cover for waterfowl, and upland species. In addition we will produce energy by capturing existing pressures in a hydraulic center pivot and a micro-hydro turbine.

Evaluation Criteria

As stated in the problems defined section this company has unique problems that result in a loss of water through various methods.

(a) Quantifiable Water Conservation

Subcriterion No A.1(a)-Canal Piping:

First and foremost the water losses occur from seepage, distribution failure, operational waste, on-farm technology, and evaporation in the open earthen ditch. This water loss estimation is based on the amount of water that is moved through the open ditch, held in storage in the reservoir, and finally arrives at farms. It takes into account the soil types, the amount of water and the duration the water is in the ditches. This project will replace 4.5 miles of un-lined, earthen canals located in gravelly soils with 21.740 feet or 4.1 miles of 100 psi PIP plastic irrigation pipe. The new installation will result in significant water conservation and utilization of currently wasted hydraulic energy.

This is substantiated by the following engineering references. Referring to water lost in transit from storage to farm, the authors Linsley and Franzine state that "with open ditches, conveyance loss will usually range between 25 and 40 percent of the diversion. Conveyance losses may be virtually eliminated by using a pipe system...." (Linsley & Franzine, 1979) According to the book Irrigation and Water Resources Engineering by G.L. Asawa there is approximately 8 meters cubed/sec of water loss per million square meters of wetted area of a canal for gravel sand soils.

To obtain the site specific water loss for canal piping and lining we interviewed the knowledgeable people associated with the systems. That was the board of directors, managers, and watermasters. The watermaster has notebooks that measure flow in and out of the reservoir. These measurements were instrumental in accounting for seepage loss.

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We then contacted the local representatives from the Natural Resources Conservation Service (NRCS). They provided any previous studies done by their organization. The technical staff associated with the conservation districts used available technology such as GIS, Soil Surveys, IDWR water rights, and water accounting models.

On June 26, 2013, Bryan Heiner, Hydraulic Engineer, TSC Hydraulic Investigations and Laboratory Services Group completed pre-project inflow/outflow measurements at another Reclamation project in Franklin County. Following the same quality assurances procedures we took pre-project measurements at multiple locations using a acoustic Doppler current profiler device. SWCC and Oxford Irrigation worked together to identify specific measurement locations. Measurements were taken by SWCC staff with Hunter Moyles, President on site. Efforts were made to schedule the measuring at periods when turnout deliveries were at a minimum. (see attached water saving data)

In addition to flow measurements we measured the canal and completed a cross section. Using this as a model we assumed the canals have a bottom width of 4 feet and a depth of approximately 2 feet and a wetted perimeter of 6 feet.

Table 1- Estimated water loss per mile

	Miles	Water loss per mile (AFA)
Oxford Ditch	1.65	729.91
Yearsley Lateral	1.30	39.04
Moyles Lateral	.02	91.15
Combe Lateral	.03	54.65
Wood Lateral	.80	63.78

*(calculation on the attached water saving data)

Using our past experience we calculated our seepage loss by completing a simple calculation based on the length of ditch, the soil type, and the quantity of water that passes through the section of ditch. We verified this with the flow measurements obtained by a handheld Doppler device. We estimate the seepage loss to be 978.53 acre-feet. (See attached water saving data sheet)

Estimates of free water surface evaporation are frequently obtained by multiplying pan evaporation by a pan coefficient. We have used a simple method whereby the monthly pond evaporation can be calculated using an evaporation map from the NOAA evaporation atlas and monthly percentages of annual evaporation developed from monthly evapotranspiration and pan evaporation data (University of Idaho, 1992). This premise compares the evaporation in an irrigation ditch to a shallow pond and is useful for estimations only. Based on these calculation we estimate 97.85 acre-feet of water is lost to evaporation

The company mainline is only a portion of the agricultural irrigation system. No productivity would be possible without on-farm systems to complement the company. When the mainline is converted to a pressurized system it produces the requirement to convert from flood to sprinkler. We will convert about 50 acres from flood to sprinkling. Based on the 30% increase in efficiency when converting from flood irrigation to sprinkler we project water saving of 1.4 acre-feet.

In summary, the proposed project would result in a quantitative annual water savings of 1080.31 acre-feet per year as summarized in Table 2 and a quantitative benefit of reducing the leaching of nutrients, the transport of noxious weeds, and the sedimentation loading of the reservoirs due to soil erosion.

Table 2- Estimated Water Savings

	Total
Seepage Loss	978.53 acre-feet
On-farm	1.40 acre-feet
Evaporation Loss	97.85 acre-feet
Distribution Loss	2.52 acre-feet
Total Water Conserved	**1,080.31 acre-feet**

*(calculation on the attached water saving data)

Subcriterion No A.1(b)-Improved Water Management:
As part of the project, the irrigation company will improve the distribution of irrigation water by installing adequate measuring devices at each service connection. This metering method will consist of an inline Seametric magnetic meters at the point of delivery. These meters will be used to confirm the amount of water released and the water use of each stockholder's water allowed by

share. These meters will be installed during construction and maintained by the company. Installation of meters as a water conservation measure has resulted in water savings of up to 42% at a location in California (Stockton East Water district, 2001).

Average water supply calculated by diversion from Oxford Creek, Gooseberry Creek, and Oxford reservoir water rights. This data was obtained from the USGS Idaho Streamstats. It tracks peak flow, low flow, monthly, and annual basin characteristics. Urban and impervious conditions are factored into these Streamstats (USGS, December 20, 2013)

Estimated Amount of Water Better Managed acre feet per year 3,028.96 = .76
Average Annual Water Supply 3,991.68

Subcriterion No. A.2-Percentage of Total Supply

Estimated Amount of Water Conserved 1,080.31 = .27
Average Annual Water Supply 3,991.68

Subcriterion No. A.3-Reasonableness of Costs

Many installations of pipe in water applications are already reaching 30 years of successful service. The PVC pipe industry estimates a service life for PIP pipe to conservatively be 25 years. This relates to savings in replacement costs for generations to come. (Plastic Pipe Institute, 2009)

According to the U.S. Department of Energy, Energy Efficiency and Renewable Energy the average lifespan of a hydropower facility is 100 years. (Dept. of Energy EERE, 2004) Maintenance of the turbines etc. can be expected at 50 years.

$598,644.46 (Total project cost) = 22.17
1,080(AFA Conserved) x 25 (Improvement Life)

$598,644.46 (Total project cost) = 3.95
3,028.96 (AFA Better Managed) x 50 (Improvement Life)

(b)Quantifiable Energy Conservation

Subcriterion No B.1- Implementing Renewable Energy Project related to Water Management and Delivery.

Renewable energy generates a range of benefits at the local, state, regional, national, and global levels. It uses natural resources, reduces greenhouse gas emissions, and reduces U.S. dependence on foreign energy sources. Renewable energy can also furnish long-term price stability as they rarely depend on costly fuel sources. (Dept of EERE, July 2011)

The U.S. Department of Energy (DOE) Federal Energy Management Program (FEMP) Guide to Integrating Renewable Energy in Federal Construction helps Federal agencies understand renewable energy options, select appropriate types of renewable energy technologies, and integrate these technologies into all phases of new construction or major renovation projects. This guide is

structured to address renewable energy considerations at each stage of the construction process. Our project follows the Guide to Integrating Renewable Energy in Federal Construction.

The environmental benefits of renewable energy technologies are extensive. By using an Environmental Impact calculator provided by Rocky Mountain Power our project that produces 42,713 Kw hours offsets 52,438 lbs of CO_2. This is equivalent to planting 616 trees. (see attached RMP calculator)

As requested we will describe the following:

Amount of energy capacity.....58.54 kilowatts

Amount of Energy generated.....42,713 kilowatt hour per year

During our screening phase Alpha Engineering calculated potential power generation using monthly flows for 2008-2010 and the following data (see attached Power Generation)

Gross head 80ft	Time 730 hrs/month	Efficiency 64%
3 yr average flow 818.07 AFA	Power output 58.54 KW	Power Generated 42,731 kWh

and the calculation $HL = [Q / (0.432 \times C \times D^{2.63})]^{1/0.54}$

Power Output = EFF. x [(Q x H) / 11.81]

During our screening phase we asked Mr. Kerry Schwartz, Provo office, Bureau of Reclamation for some clarifications. During this discussion Mr. Kerry Schwartz also confirmed that this project needs to address the requirements and regulation associated with the FERC process not the Lease of Power Privilege.

(c) Benefits to Endangered Species

The benefits of this project make this a favorable project. This pipeline portion makes a very small if any impact on the environment. This is substantially offset by increased water levels in the reservoir for water fowl and agricultural improvements in the uplands for grouse and other terrestrial animals.

As stated on the attached Species by County report for Franklin County Idaho from the USFWS there is 2 snails and 2 mammals listed as a federally-recognized threatened, or endangered species. In addition there are b45 bird of conservation concerns Our project will benefit these species, by creating better suitable habitat. It will definitely not further damage these species.

Water will be used more efficient out of Oxford Creek to help address the lack of water on the Oxford Slough WPA. The Oxford Slough WPA is currently updating their management plan to help create better habitat for migratory species. The Oxford Reservoir company will take part in the planning process.

During the installation and maintenance of the project all necessary precautions will be address to alleviate the take and or destruction of any threatened or endangered species, as well as minimal disturbance to any critical habitat.

(d)Water Marketing

Subcriterion No D.2-Crop Shifting or Idling Transfers.
Currently the cities in Idaho are experiencing growth. This is placing pressure on the availability of culinary water. In addition due to recent changes in water policy in Idaho, any community wells must be mitigated with the purchase of surface water. This additional water could be purchased by developers to address this mitigation.

Based on legal advice concerning the distribution of water outside the authorized service area, a direct sale allows for confusion and may damage the future Oxford reservoir and Irrigation Company water rights. The Idaho water bank has been created for this very situation.

Subcriterion No D.3-Other Transfers.
We will hold an exploration and development seminar on Water Banking in an irrigation district, and/or watershed for the water managers. We will provide a panel of experts and agencies to facilitate discussion and questions & answers. Water managers will learn about tools and techniques with an emphasis on water banking which will benefit the environmental, the farmer, and most important provide an alternative to the conflict and tension over future water supplies. This seminar would benefit from Reclamation input and even participation.

We are suggesting the following tentative speakers and participants for the panel: Idaho Department of Water Resources to discuss water banking potentials, keeping the Idaho laws in mind; Bear River watermaster to discuss the irrigation rights and current water appropriation; Water Law attorney to provide legal answers to the questions and provide assurance that the process protects water rights.

Conservation districts are in the distinctive situation of being able to assist small irrigation company's or lateral associations that would be unable to utilize such funding opportunities as is being presented by the Water SMART program. Within the framework of a conservation district, is access to technical assistance from the Natural Resource Conservation Service and various other entities such as Idaho Association of Soil Conservation Districts, and the Idaho State Soil Conservation Commission(SWCC). This coordination and cooperation becomes vital in providing education to the agricultural community that is respected and perceived as in the cooperators best interest. The Franklin Soil & Water Conservation District will administer the water seminar and ensure participation of the local agricultural community.

In addition we will take an interagency approach when coordinating existing programs such as the NRCS snotel data and runoff forecast. We can couple this information with drought forecast provided by U.S. Drought Monitoring and provide education to Irrigation Company's and individual landowners that can be used to conserve water.

Implementation

(a)Project Planning

This project is located within the Bear River Basin, which is situated in the Southeast corner of the State of Idaho. The Bear River begins in the Uinta Mountains in the State of Utah. It flows northerly into the State of Wyoming returns to Utah then back into Wyoming. At river mile 245 it

enters the state of Idaho. The river leaves Idaho at river mile 100 and enters Utah for the last time. After traveling 440 miles from its headwaters, the Bear River enters the Great Salt Lake.

Because of our close proximity to the state of Utah and the knowledge that river basins do not follow political boundaries we need to harmonize our planning efforts with the State of Idaho Water Plan and the State of Utah Water Plan

"The Idaho State Water Plan emerges from a vision of Idaho in which water is used efficiently, and is allocated through laws that fully conform to the prior appropriation doctrine." A goal of the state water plan is to secure greater productivity, in both monetary and non-monetary terms, from existing water supplies. Water used policies are concerned with improvement in practices, procedures, and laws relating to existing water use. Specific to the Bear River Basin, it is the policy of Idaho to encourage additional projects for the development of the water resources of the Bear River Basin without regard to state boundaries. (Idaho Department of Water Resources, waterplan)

The Bear River Compact and the interagency, multi-state Bear River Commission created to administer provisions of the Compact provides additional Basin guidance. This compact has been in effect since 1958, and water allocations for the entire basin were adopted in 1978. The compact must be reviewed at time intervals of not less than twenty years and may be amended during the review process. The goal of Idaho's representatives on the Commission should be to urge conjunctive management of ground and surface water resources within the Bear River Basin and to seek as much of the unconsumed flow entering the Great Salt Lake as possible for Idaho while negotiating in good faith with the other states. (. (Idaho Department of Water Resources, waterplan)

"The state of Utah's role is to set policy, provide assistance and protect statewide water resource interests". This guiding principle is the basis for The Utah State Water Plan, a series of documents that includes a statewide plan and an individual water plan for each of the state's eleven hydrologic river basins. This document is Utah's guide for the stewardship of its water resources. The state recognizes the urgent need to implement effective water conservation measures. These coupled with other innovative water management technologies, must be implemented to safeguard the ability of existing water supplies and new developments to meet future needs and lessen impacts of drought. (UDWR, May 2001).

Out of the eleven river basins the Bear River was placed first on the planning list mainly because of the relationship between the Bear River's water supply and the Wasatch front's projected demand. "One goal of the river plan is to help direct the orderly planning, conservation, development, protection, and preservation of Utah's water resources at the local level." These plan intentions are that both the formulation of a plan and its implementation will provide for a balance of environmental, economic, social, and political factors. (Utah Board of Water Resources, January 1992)

Since irrigated agriculture is the largest user of water in Utah, many have suggested that using water more efficiently in agriculture is the main solution to meeting future water needs.

Overall this project is based on the statement that water agencies and institutions must fully integrate strategies and policies into their operations to address conservation and development of water resources along with water quality, recreation, and environmental issues.

(b)Readiness to Proceed

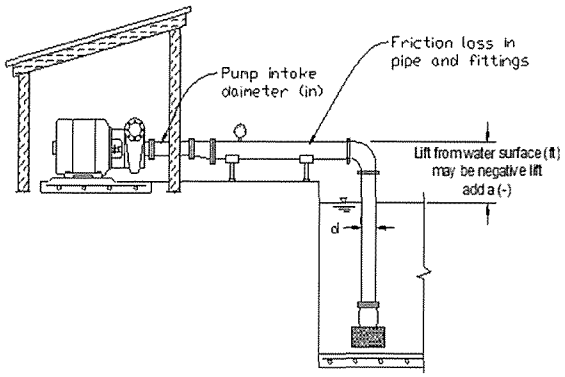
Implement Plan- Major Tasks

Screening of energy options: The first step in assessing renewable energy options was to conduct a preliminary screening to distinguish between technologies that are worth reviewing and those that should be eliminated without further analysis. Preliminary screening involved resource maps and other basic tools to choose technologies to pursue further. This screen also included technical and design issues, resource assessment, relevant policies and incentives, utility tariffs and interconnections issues, NEPA evaluations, and project funding mechanisms.

The next step in assessing renewable energy options was a full screening. It is a review of the possible technology options that identified dead-ends and further narrows the list to probable technologies for the project. Then a more detailed look at the available resources and a high-level analysis of expected costs and savings, utility considerations, and potential incentives was undertaken. This screening also assessed each technology's ability to contribute to energy goals and requirements. The company analyzed specific sites throughout the system to decide which areas have the greatest renewable energy potential.

Preliminary Energy Survey: This study estimated the potential of hydro energy by gathering data such as estimated head and available flow from historical records. Power production data and preliminary interconnect requirements were analyzed and provided. Preliminary construction costs and a economic feasibility was provided. A field survey was completed to provide more accurate data to define the total head available and right-of-way requirements. The basic method of sizing an irrigation system including assessing the flow (the volume of water passing through the pipe), determining the residual (additional) pressures available, calculating any pipe or other head and flow losses, and evaluating the technical requirements of the irrigation system was completed.

Figure 2- Typical pump layout



Preliminary Hydraulic Engineering: The report from this study will provide a comprehensive framework from which final design can be completed. Included are the following: -preliminary GPS survey, -hydraulic analysis and sign, -delineation of all users and locations, -establishment of alignments, -establishment of final design criteria, -construction planning, -institutional issues, -construction cost estimates, and -life-cycle cost analysis. This report will be provided to Reclamation for input. Preliminary engineering was obtained by working through the pipeline hydraulics based on Hazen-Williams formula. (ID-40) This provided estimated design outputs including pipe size and length, flow velocity, pressure rating, thrust blocks, and appurtenances. Various end points were surveyed by technical staff. A manufacturer recommendation for the turbines was obtained and including in the feasibility reports

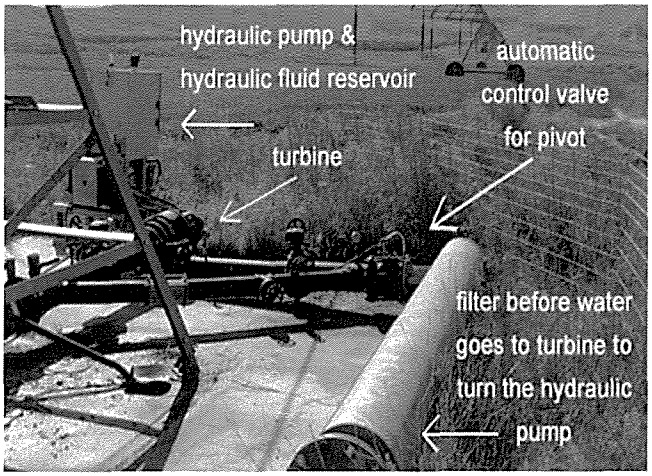
Final Design & Survey: The final design package will contain the construction drawings, specification, and operations manual. NRCS standards and specification for an irrigation system

(ID-442) will be adhered to during design and construction. The pumping plant specification (ID-533) will include an integrated hydro turbine. This report will be provided to reclamation for input

Construction: The Oxford Reservoir and Irrigation Company is committed to construction. This will begin with a new diversion box off of Oxford creek which will be conveyed by a 12 inch 100lb PIP pipe, to the Oxford reservoir. At any degree change over 7% a thrust block will be installed, and at any water shutoff locations. At the diversion point there will be a meter to measure flow into the reservoir. There will be two location where a 12 inch tee and two gear driven butterfly valves will be installed where water can be taken out during non-use months for Oxford Creek Irrigation Company and the Oxford Slough WPA.

The outlet from the Oxford reservoir to the user diversion will run from a 12 inch metal pipe to an 18inch 100lb PIP pipe and reduced back to a 15inch 100lb PIP pipe where the line will be teed twice to run to the Yearsley lateral and the Wood lateral. Each later will have a water meter, and shut valve to better manage water use. The pipeline will end at each of the Yearsley, and Wood regulating ponds. The Moyles lateral will be 15inch 100lb PIP pipe that runs into his holding regulating pond along with a water meter, and shut off valve. From the Moyles regulating pond the Combe lateral will be a 15inch 100lb PIP pipe that will have a water meter and a shutoff valve installed that will end at the Combe Regulating pond.

Irrigation water is delivered in a pressurized pipe. Due to the hydraulics of the system there is 120-180 pounds of pressure per square inch (psi) at the on-farm connection. This is much more than is needed in a sprinkler system. It is currently wasted in a pressure reducing station which has a lot of operation and maintenance associated with it. We propose to capture this renewable energy by passing the water though the vanes of a hydro-turbine system to power a pivot system. Water under pressure causes the turbine to spin and turns a hydraulic pump that pumps hydraulic fluid through gears that the wheels, moving the pivot around the field.



Along the way the pressure is reduced by 40-45 psi, just the right amount to keep from damaging sprinkler nozzles. One disadvantages of the system is that water must be running though the turbine to move the pivot. We will install the system with a backup electric meter to be used in this uncommon situation. This will also provide the mechanism for us to net-meter any additional power generated but not needed by the pivot.

Net metering utilization requiring an interconnection agreement for net metering service (up to 100KW) will be submitted to Rocky Mountain Power. Construction will adhere to the inverter specifications sheet and have the required permanent signage in place.

Table 3...Project timeline

Task	Responsibility	Completed
Preliminary screening	FSWCD/Oxford	2013
Screening	FSWCD/Oxford	2013
Feasibility Study-Energy	FSWCD/CIC/RD/Engineer	2011-2012
Preliminary Eng-Hydraulic	SWCC/Oxford	2013
Task	**Responsibility**	**Scheduled**
Initial Stakeholder Consult	FSWCD/Oxford	Winter 2014
Environmental compliance	FSWCD/Oxford /BOR	2014-2015
Hydraulic Survey	Oxford/ Engineer	2015
Easement	Oxford	Spring 2015
Exemption application	Landowner/FERC/Engineer	2015
Final design	Engineer	Winter 2014-2015
Interconnect agreement	Landowner/CIC/RMP	2015
Task	**Responsibility**	**Scheduled**
Pipe procurement	FSWCD/Oxford	2nd yr 2015
Contractor selection/permit etc	FSWCD / Oxford	2nd yr 2015
Mainline construct	Oxford	2nd yr 2015
Pivot installation	Landowner/Engineer	2nd yr 2015
Turbine installation	Landowner/Engineer	2nd yr 2015
Construction Inspection	Oxford/SWCC / FSWCD	2nd yr 2015
Filling & Testing	Oxford/SWCC	2016
Net metering	Landowner/RMP/CIC	2015-2016
Task	**Responsibility**	**Scheduled**
Verification of savings	FSWCD/Oxford	April- Oct 2016
Operation and Maintenance	Oxford/Landowner	Ongoing
Reporting	FSWCD/Oxford	As required
Project coordination	FSWCD	Ongoing

Construction Inspection: The construction will include construction engineering for unforeseen conditions, inspection, and quality control. The company with the assistance of the FSWCD will do the on-site construction inspection. A project superintendent will be assigned by the company. This position will be on-site the majority of the time. The duties associated with this position include: Coordinate and supervise all subcontractors, construction and scheduling of work. Oversee all ordering and receiving of construction materials. Function as coordinator and liaison to property owners and stockholders regarding all construction activities and services to be provided by the irrigation company. Review and approve all invoices; assist with monitoring of project budget and bookkeeping. A report of these activities will be provided to reclamation for review and input.

Operation and Maintenance: A properly operated and maintained irrigation pipeline is an asset. This irrigation pipeline is designed and installed to transmit water to place of use. The estimated life span of this project is at least 25-50 years. The life of this pipeline can be assured and usually increased by developing and carrying out a good operation and maintenance program.

Project Coordination and reporting: FSWCD has administered all of the previous Reclamation grants. We are familiar with the federal forms and the ASAP financial reimbursement process. The staff with the Franklin SWCD will do the Program Performance Reports and the Fiscal reporting.

Regular meeting with the board of directors will be held. During the annual meeting a report will be provided to the stockholders and waterusers.

Other Contributions to Water Supply Sustainability

Growing population tends to increase the overall demand for land and water. Agriculture has been responsible for much of the existing water development, and thus controls a large supply of relatively low-cost water and land that is attractive to new developments. (Utah Board of Water Resources, 1992)

Farming has undergone fundamental changes in recent years that have resulted in many farmers leaving the farm entirely or relying on off-farm employment. Farmers in the Bear River Basin who have survived have done so by becoming adept at increasing efficiency and productivity. As stated in the Bear River Basin Cooperative study completed in 1978 conveyance improvements "could be made by lining canals thought high seepage area, piping canals through high failure hazard area, constructing diversion dams at canal headings, and providing adequate control structures and measuring devices. (USDA-SCS and Forest Service, 1978)

Thirty six years later we still consider these problems associated with water in the Bear River Basin. Implementation of efficiency improvements are stalled in general because Bear River farmers cannot afford to pay the full development cost of water improvement projects without financial subsidies or other incentives.

The multi-state Bear River Compact, existing water rights, wide variations in annual runoff, and scarcity of favorable new Reservoir storage sites limit development of additional water. The need for water will not decrease thus the answer to the potential water supply crisis is the efficient use of existing water. About 60 percent of the total water in the Bear River Basin is used for irrigation. Because of this, an improvement in irrigation efficiencies would impact the largest volume of water and produce measurable improvements.

In Idaho, the Bear River Drainage is the only basin that drains into the Great Salt Lake. The water savings produced in Franklin County has a very short trip downstream to where it meets the Wasatch Front, one of the highly likely conflict areas. The Utah Department of Water Resources has placed a high priority on planning and projects in the Bear River Basin due to potential benefits resulting to the impacts on the Wasatch Front.

As discovered during the problem identification phase the irrigators need education on using crop requirement data to schedule irrigation deliveries to conserve early-season flows for later in the season.

Slowing the rate of withdrawal will provide late season irrigation water to bring crop yields in existing fields up to their potential. This will also alleviate the issues with a companywide water budget where too much water is diverted early in the season and not enough water later in the season. This will help narrow the wide range in efficiency throughout the irrigation season.

Proper implementation of agriculture water-use efficiency typically provides increases in crop yields of 15-30 percent. Based on our experience with previous pipeline conversion for every acre foot of water saved an additional $35.00 in crop production is generated

Performance Measures

To verify and document that the proposed water and energy conservation project achieves the estimated benefits we will finalize and execute a quantifiable plan that clearly defines the goal, encourages the use of appropriate analysis, takes into consideration cost-benefit, and increases the efficient use of management resources.

The fundamental part of our plan will be accurate measurement. A side effect associated with metering is the data obtained from the meters is useful to the appropriation of the water district. Well-located meters such as the master mainline meters and the meters for on-farm use can demonstrate where and when the water is used.

To provide the necessary quantified data of water saved, or better managed integrated with production of renewable energy we propose the following performance measures:

Canal lining or piping--
To estimate our pre-project benefits we utilized proven accepted methods and used the experience gained on June 26, 2013 from Bryan Heiner, Hydraulic Engineer, TSC Hydraulic Investigations and Laboratory Services Group.

The plan for water savings verification consists repeating the pre-project inflow/outflow measurements to estimate before and after seepage. Two sets of project measurements (early and late season) at multiple locations are planned using a handheld acoustic doppler velocimeter attached to a wading pole. Efforts will be made to schedule the measuring at periods when turnout deliveries are at a minimum.

Water levels in the reservoir will be compiled into an electronic data sheet. Notes will include the snowpack levels at the beginning of the irrigation season and any unseasonable weather events during the season.

Measuring devices--
Pre-project estimation is based on knowledge obtained from the watermaster. They attempt to count nozzles but do not feel confident this is the best method. Measuring the water as it leaves the reservoir is not done in a measuring device.

Idaho Department of Water Resources completed a comprehensive study of the reliability of meters. This compared various types and manufacturers. They have endorsed magnetic meters as the best method of measuring in a pipeline. Post-project will involve surveying the stockholder to determine the reliability of the magnetic meters. The meters are vital to getting a quantifiable savings.

Endangered species benefits—
The methodology to determine the recovery rate of the species that use the Oxford reservoir will be by ocular population surveys. Surveys will be conducted to get estimate use, and response to better managed water use. Currently the Idaho Department of Fish and Game does an annual population survey of swans, and pelicans on the reservoir. We can verify population response with their historical monitoring data.

Water marketing education--
We have planned activities that teach analytical skills and informed decision making that motivates producers to take responsible actions that will protect the environment. It is our intent to try to reach out to as many water managers as possible by offering a seminar to expose them to water marketing and possibly new ideas and technologies that may be used during this project. This seminar will also be open to government staff and may provide insight to potential ideas in their own technical service area.

In addition to the seminar, we plan on reaching out to the state of Idaho through posting our project information on the Idaho Association of Soil Conservation Districts blog and web page as well as the Franklin SWCD facebook page. In order to reach more people we will also provide information the traditional way to local producers through our local county fair. Each year the franklin SWCD sets up a fair booth to let the public know what projects they are involved in and how this benefits local conservation in our county.

Renewable Energy produced--
This facility will be equipped with electronic monitoring system to collect inverter energy production data for a period of five years. The monitoring system must consist of a production history electronic database, web-page component, and a public web link to be added to Rocky Mountain Power's web page for educational purposes.

Connection to Reclamation Project Activities

Our project manager, Franklin SWCD has assisted the following projects in Franklin County.

Bureau of Reclamation Water 2025 program year 2005 (05-FC-40-2405) $300,000.00 was leveraged with shareholder assessments to retrofit the Lamont Reservoir, design, and convert 5.5 miles of open ditch to 4.4 miles of underground pressurized pipeline.

Bureau of Reclamation Water 2025-year 2008 (FC-08-FC-40-2827) $300,000.00 federal dollars were used to complete for the irrigation season 2010 a 2.5 million dollar project consisting of phase 1 and phase 2 of the Fairview Lateral. This project replaced 7.5 miles of un-lined, earthen canals with 7.2 miles of high-pressure, plastic irrigation pipe.

Bureau of Reclamation ARRA funding sub grant with Idaho Water District #11- Bear River (R09AC40R12) provided $3,838,759.00 federal money for installing water measuring devices and converting 35.6 miles of open ditch to pipelines and 450 feet of polyurea lining. This project was completed in 2011.

Bureau of Reclamation WaterSMART program year 2012 (R12AP40027) $1,453,181.00 federal dollars used to replace 6 miles of ditch with 3.5 miles of high pressure pipe. Existing irrigation water will generate 2,525,193 kilowatt hour per year of renewable energy in a micro hydroelectric facility.

Environmental and Regulatory Compliance

Since construction for 100 percent of this project will be located on private land, most components of the action plan can be implemented without extensive environmental compliance activities. To meet any requirements of state, federal, and local environmental, cultural, and paleontological resource protection laws and regulations we modeled our preliminary approach to the environmental evaluation used in the planning process practiced by NRCS (See attached NEPA flowchart). This environmental evaluation integrates environmental concerns throughout the planning, installation, and operation of projects. Planning intensity, public involvement, and documentation of actions vary according to the scope of the action.

During the preliminary engineering phase, we will complete an Environmental Evaluation using directives in the National Environmental Compliance Handbook (NECH). This data will establish objectives proportionate with the scope and complexity of the proposed action. In essence this will be the building block for the environmental assessment.

Prior to construction and upon direction from Reclamation we will undertake an Environmental Assessment based on the established objectives. A multi-disciplinary team focusing on resource considerations, economic and social considerations, and any project specific special environmental concerns will do the bulk of this assessment. This team will identify environmental concerns that may be affected, gather baseline data, and predict effects of alternative courses of actions. This information will be presented at a public meeting in conjunction with a Franklin SWCD board meeting and/or the annual meetings of the irrigation companies.

We do not feel an Environmental Impact Statement will be needed because this project does not involve stream channel realignment, a congressional action, cumulative impacts on the human environment, or actions significantly affecting the quality of the human environment. (NRCS, 2003) In addition during March 2010 an Environmental Assessment and Finding of No Significant Impact (PRO-EA-10-008, PRO-FONSI-10-008) was completed on a similar project. Brian Joseph, Archeologist from the U.S. Bureau of Reclamation stated that a site specific investigation would have to be undertaken but predicted no problems unless the proposed site has historical importance.

In conjunction with the federal requirements a request will be made to the Idaho State Historical Preservation Office (SHPO). All requests for additional reviews, if any, will be compiled with before any excavation is undertaken.

As ask for in the request for proposal we have answered the following questions:
1). Will your project impact the surrounding environment? If so, please explain the impacts and any steps that could be taken to minimize the impacts. During construction soil and vegetation will be disturbed. Care will be taken to ensure that this is minimized and no sediment is transported from the construction site into waterways using such methods as silt fences etc. The construction will take place in predominately agricultural land that will be reseeded into annual or perennial vegetation in the next crop cycle. If it is not agricultural land, it will be reseeded into perennial vegetation.
2). Are you aware of any endangered or threatened species in the project area? The Conservation Data Center (CDC) database, which is a compilation of sighting for species of concern, candidate and threatened and endangered species, was used to create the attached Map titled Sensitive

Species. Within the project area is no known endangered/threatened or species of concern. In addition no critical habitat has been designated.

These data include documented historic, extirpated, and extant occurrences of special status nonvascular and vascular plants. It is necessary to look at the associated database record for any given occurrence to understand it fully. WHERE THE DATA COMES FROM. Occurrence records are based on information provided by a variety of individuals, including Idaho Department of Fish and Game staff, federal agency personnel, state agency personnel, academic researchers, and, in a few cases, the general public. WHAT'S AN OCCURRENCE? An occurrence is defined as an area of land and/or water in which a species is (or was) present, and an occurrence represents different things for different taxa. For plants, an occurrence often corresponds with the local population, but it might also be a portion of a population or an aggregation of populations (i.e., a metapopulation). THIS EXPORT IS NOT AN UPDATE. The Idaho Fish and Wildlife Information System (IFWIS) data set is dynamic, meaning that (a) some species (particularly plant species) are dropped each year because as they are found to be common, under no threat, or because they have been misidentified; (b) better and more recent information on existing occurrences results in changes to database records; (c) taxonomy has changed; or (d) taxa are added to the tracking list. Because of the dynamic nature of the data set, each new export completely replaces any previous export in order to ensure that current data are being used for planning purposes.

3). Are there wetlands inside the project boundaries? If so, estimate how many acres of wetlands there are, and describe any impact your project will have on the wetlands. Based on the data provided in the Wetland Inventory by Office of Biological Services for the National Wetlands Inventory, USDI, Fish and Wildlife Service within our project area are 12 wetlands ranging from 1-5 acres (see attached wetland map). This information in this wetland inventory was obtained from aerial photographs and "no attempt to define the limits of proprietary jurisdiction of any federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies"(USDI. Fish and Wildlife Service, 1980). The attribute PEM1A define this ecological system as Palustrine(P), Emergent(EM),Persistent(1), and Temporary(A). . The attribute PEM1C define this ecological system as Palustrine(P), Emergent(EM),Persistent(1), and Seasonal(C). . The attribute PSS1C define this ecological system as Palustrine(P), Scrub/shrub(SS), Broad leaved deciduous(1), and Seasonal (C). The attribute PFO1C define this ecological system as Palustrine(P), Forest(FO), Broad leaved deciduous (1), and Seasonal(C). The attribute PAB4F defines this ecological system as Palustrine(P),Aquatic bed (AB), Floating-leaved(4), and Semipermanent(F). The attribute PSS1A defines this ecological system as Palustrine(P), Scrub/shrub(SS), Broad leaved deciduous(1), and Temporary(A).

Based on this and our field knowledge any construction in this area will require a section 404 Joint Application for Permits from the U.S. Army Corps of Engineers and the Idaho State Water Resources. Due to these being temporary, artificial wetlands due to subbing from the irrigation Reservoir, we feel that construction will be approved under an agricultural exemption. Alignment of the pipe and construction will be designed to minimize impact on this wetland. This will require a construction method that does not allow the underground pipe to become a French drain.

4*). When was your irrigation system constructed?* The Oxford Cub River Canal consisting of #1 south fork to north fork and #2 north fork to the reservoir received a proof of completion works on June 17, 1920. Supply ditches from reservoir to irrigated lands constructed from the incorporation

date of March 22, 1899 to 1914. The reservoir was built in 1912 and received notice to raise it an additional 5 feet to its present level in June 1920.

5). If your project will affect individual features in your irrigation system, state when those features were constructed and describe the nature and timing of any extensive alterations or modifications to those features..

6). Are any buildings, structures, or features in your irrigation district listed or eligible for listing on the National Register of Historical Places? No, none are listed. This was confirmed by checking The National Register of Historical Places in Idaho for Franklin County (Davis, Belinda and Swanson, Ann. 2004).

7). Are there any known archeological sites in the proposed project area? No, Based on recent requests from other irrigation projects located in the area to the State Historical Preservation Office. Requests are coming back needing a site visit due to there proximity to surface water, but are passed upon a site visit from a certified cultural resources representative.

8). Will the project have a disproportionally high and adverse effect on low income or minority populations? The per capita income for the county was $10,346. About 10.9% of families and 14.1% of the population were below the poverty line, including 19.0% of those under age 18 and 10.3% of those age 65 or over. The U. S. Department of Housing & Urban Developments lists the low and moderate income persons as 27 of the 37 persons or 72.97%. Due to the economic values associated with improved crops this project will provide a potential improvement to the income of the residents of Oxford. (U.S Department of Housing. 2013)

9). Will the project limit access to and ceremonial use of Indian sacred site or impact other tribal lands? No ceremonial sites are known to the local farmers. We referenced a historical map of archeological and historical features of the Bear River Basin found in the 1978 cooperative study. The legend included open sites, rock shelters, burial sites, trapper rendezvous, trapper trails, emigrant trails, and pioneer routes.(USDA, Soil Conservation Service, Forest Service, and Economic Research Service. 1978)

10). Will the project contribute to the introduction, continued existence or spread of noxious weed or non-native invasive species? According to the Utah & Idaho Coordinated Weed Management Area, Canadian thistle, dyers woad, and leafy spurge, are the main noxious weeds found in the vicinity of the canal. This pipeline would eliminate their environment and stop the spread of their seeds downstream.

Environmental Compliance Costs

Environmental and regulatory compliance costs include the cost incurred by Reclamation and the Franklin Soil & Water Conservation District to:

- determine the scope and complexity of the proposed action,

- organize a multi-disciplinary team focusing on resource considerations, economic and social considerations, and any project specific special environmental concerns,
- review the environmental reports prepared by each discipline, and
- compile this into an overall environmental evaluation.

This cost is included as a line item in the budget. It is equal to 2% of the total construction costs. Per the RFP we understand that these costs must come out of the local funds.

Permits and Approvals

During the preliminary planning/engineering process all permits, easements, or approvals will be identified. Based on the court case (Talent Irrigation) irrigation ditches and canals are being considered waters of the U.S. and subject to regulations by the U.S. Corp of Engineers. This project will request a jurisdictional determination and fulfill all necessary requirements associated with this permitting process. All available exemptions have been investigated and based on recommendation from our local U.S. Corp of Engineer representative this project will proceed as an activity with minor impacts.

It is the responsibility of the irrigation companies to negotiate and obtain the necessary easements. These are only necessary when an existing historical right of way is not available. Additional easement will be needed and the landowners have been approached. All of the cropland easements are owned by shareholders of the irrigation company. They wish to remove the open ditches so wheel line and pivot irrigation practices can be utilized.

The Public Utilities Policies Act of 1978 (PURPA) created an obligation for electric utilities to offer to purchase power from, and interconnect with, qualifying generation projects. PURPA is implemented through a set of rules established by the Federal Energy Regulatory Commission (FERC) and each state. Idaho State is regulated by a public utility commission that has certain responsibilities for the implementation of PURPA as provided in the FERC rules.

It is proposed to connect power transmission lines near the energy generating facility. Rocky Mountain Power is the local utility and is supportive of alternative energy projects. In addition to net metering they have established an avoided cost purchase contract and if need to execute an interconnection agreement. Qualifying Facility interconnection agreements are administered by PacifiCorp's transmission services function.

Net metering allows a small power producer to connect to the power grid to offset the purchase of electrical energy from the utility with the surplus energy generated by the on-site generating facility. It is proposed to connect power transmission lines near the energy generating facility. A single meter measures the electricity purchased from the utility and turns backward when the small power producer feed electricity into the grid. Rocky Mountain Power Electric Service Schedule No. 135- Net Metering Idaho State is the Idaho Public Utility Commission tariff defines net metering and its conditions. This restricts the generating capacity to one hundred kilowatts for irrigation customer on schedule 10.

We must execute an interconnection agreement and provide the interconnection on customer side of the meter. We are responsible for all costs associated with the generating plant and any modification needed by Rocky Mountain Power to accommodate their acceptance of our power.

Funding Plan

Cost-effectiveness in conserving water and the economic impacts solutions will have on the farmer required to make the change are important considerations because they affect the acceptability of the project. Various methods benefit the water resource and society, but often do not provide an economic benefit to the landowner who installs and maintains them. This is why financial incentives are critical for promoting implementation of water conservation and management improvements.

As presented in the budget section of this proposal the estimate total project cost is $598,644.46. We propose to fund the construction costs by using a combination of cash reserves, future assessment on capital stock, loans, in-kind labor and equipment by shareholders, and other appropriate sources. The FSWCD has experienced the specific matching requirements associated with federal funds. Their involvement will ensure that a cost-effective, environmentally sound product is provided.

Technical assistance will be provided by various other nonfederal entities such as Water District and the Idaho State Soil Conservation Commission. Additional technical assistance by the Natural Resources Conservation Service will be provided in an oversight role ensuring compliance to NRCS standards & specifications. They will provide guidance on addressing the environmental and regulatory compliance. This is a federal agency thus no time, materials, etc. have been included in the construction project budget. This interagency involvement will guarantee an overall quality project is generated.

The in-kind match that the Oxford Reservoir and Irrigation Company will have is as follows. The shareholders will provide labor, fuel, equipment, and professional experience. The shareholders have 2 backhoes, 1 Trencher, 2 dump trucks, 2 bucket tractors, concrete mixers, and miscellaneous tools necessary to complete the project. If addition equipment is needed the shareholders have the means to obtain the appropriate equipment. The shareholders will also be holding an additional 40,000 dollars of money as in-kind match.

The shareholder also have combine experience in installing mainlines of various sizes, meter dives and concrete work. One of the shareholders previously had a construction company that specialized in underground water mains and piping irrigation ditches. One of the shareholders as been farming and installing irrigation mainlines as well his entire life. Another shareholder is a partner to the USDA NRCS and has the experience of following NRCS construction specifications.

The actual construction could not be completed at this time without Bureau of Reclamation funding. This feasibility study is only a vision for the future. Without the construction none of the proposed water savings will happen. Based on the track record of other plans done by consultants or the Natural Resources Conservation Service if a design is not constructed within a short period momentum is lost. If construction waits a long time the entire process must be redone. This is a waste of time and money for all involved.

Table 4-Funding Sources

Funding sources	Type	Funding Amount	Status
Oxford Reservoir and Irrigation (applicant)		$ 40,644.46	Approved
Oxford reservoir and Irrigation (applicant)	Inkind	$ 190,000.00	Approved
*Franklin SWCD (subdivision of state)	inkind	$ 5,000.00	Approved
*Franklin SWCD (subdivision of state)	Cash	$ 9,000.00	Approved
*Water District 13(g)- (local)	inkind	$ 1,000.00	Approved
Idaho Soil Conservation Commission (state)	inkind	$ 5,000.00	Awaiting grant approval
*Jay Ransbottom (local)		$ 50,000.00	Approved
Non federal subtotal		**$ 300,644.46**	

*commitment letter attached

Funding Group I

We are proposing a funding group I project. Thus we propose the following funding process

Year One	Year Two
Oxford Reservoir and Irrigation receives $200,000.00 funding for phase 1 consisting of engineering, permitting, environmental, procurement	Oxford Reservoir and Irrigation receives $100,000.00 funding for phase 2 consisting of Construction of Pipe and on-farm hydro.

Table 5- Funding percentages

Funding Source	**Percent of Total Project cost**	**Total cost by Source**
Applicant Funding	38.5%	$230,644.46
Partners Funding	11.7%	$70,000.00
Total Local Funding	50.2%	$300,644.46
Reclamation Funding	49.8%	$298,000.00
Total Funding	100%	$598,644.46

Commitment Letters and Partners

On January 6, 2014, in a regular meeting, the Franklin SWCD board of supervisors made an official motion that they would assist the Oxford Reservoir and Irrigation Company to pursue a funding request to the Bureau of Reclamation. Upon approval of funds, they will execute a cooperative agreement with the Oxford Reservoir and Irrigation Company to detail the project manager duties and responsibilities.(attached letter) Franklin SWCD has committed to provide $15,000.00 of in-kind services. This includes personnel and building use. Building use for meetings and conference call is included. We estimate 1-2 meeting a month for the 24 month grant time. 36 meetings at $75.00 equal $2,700.00. The Franklin SWCD will commit staff time (50 hrs. @48.89) and $9,000 cash to the energy portion of this grant.

All interconnection responsibility with Rocky Mountain Power will be completed by Franklin SWCD. In addition FSWCD will include this project in our education program. Major functions include fair and Idaho state legislative display.

On January 16, 2014 Jay Ransbottom, landowner agreed to participate in the energy conservation. (attached letter)

Idaho Soil and Water Conservation Commission verbally agreed to assist with the engineering. Steve Smith, Water Quality Technician provided GIS assistance in the feasibility and planning phases. He also provided the water measuring data. He will continue to provide GIS assistance. This work will be used in the local funding applications and the performance reporting.

He will also repeat his measuring using the same equipment to provide the quantifiable water saving for performance measuring. Due to agency procedures a written commitment cannot be submitted at this time. This commitment will be documented upon confirmation of grant funding.

Official Resolution

Article 1, Section 4 of the irrigation Company by-laws state "matters submitted to a vote of the stockholders shall be decided by a majority of the votes cast, unless otherwise specifically provided by law or by these Bylaws". The president, Hunter Moyles, presented the proposed project to all shareholders. They directed the Board of Directors to work closely with the Franklin SWCD to finalize the hydraulics feasibility and funding plan.

The board of directors for the Oxford Reservoir and Irrigation Company on December 14, 2013 met and reviewed the funding plan. They definitely feel that a grant would help the project move forward faster. (Attached resolution)

Project Budget

Budget Proposal

	COMPUTATION		Quantity Type	Total Cost	subtotal- 424
	UNIT	QUANTITY			
SALARIES AND WAGES					$ 57,250.10
Lyla Dettmer, Project manager	$ 48.89	300	HOURS	$ 14,667.00	
Project superintendent	$ 22.29	1600	HOURS	$ 35,664.00	
Hunter Moyles, President	$ 19.62	110	HOURS	$ 2,158.20	
Chris Hatch, Admin Assistant	$ 20.84	60	HOURS	$ 1,250.40	
Steve Smith, GIS technician	$ 20.06	175	HOURS	$ 3,510.50	
FRINGE BENEFITS					$ -
Full-time employees	included in salaries				
TRAVEL					$ 2,475.00
Mileage	$ 0.55	4500	MILES	$ 2,475.00	
EQUIPMENT					$ 79,000.00
turbine, generator,switchgear,controls	$ 17,000.00	$ 2.00	EACH	$ 34,000.00	
irrigation system	$ 45,000.00	$ 1.00	EACH	$ 45,000.00	
SUPPLIES/MATERIALS					$ 1,535.32
Office Supplies	$ 1,535.32	$ 1.00		$ 1,535.32	
CONTRACTUAL/CONSTRUCTION				$ -	$ 444,098.91
Pipe material	$ 10.00	21,740	FEET	$ 217,400.00	
Pipe Installation	$ 6.00	21,740	FEET	$ 130,440.00	
Appurtenant work	$ 0.50	21740	FEET	$ 10,870.00	
Water Control Structure	$ 1.00	$ 3,339.44	EACH	$ 3,339.44	
Measuring devices	$ 5.00	$ 1,355.00	EACH	$ 6,775.00	
Hydro installation	$ 4.00	$ 6,250.00	FEET	$ 25,000.00	
GPS survey/drafting	$ 25.00	$ 250.00	HOURS	$ 6,250.00	
Engineering	7%	$ 428,920.98	PERCENT	$ 30,024.47	
Seminar	$4,000	$ 1.00	Each	$ 4,000.00	
Easements	$ 2.00	$ 5,000.00	EACH	$ 10,000.00	
ENVIRONMENTAL AND REGULATORY COMPLIANCE	2%	$ 418,920.98	PERCENT	$ 8,378.42	$ 8,378.42
OTHER					$ 5,906.71
Reporting	$ 48.89	$ 39.00	HOURS	$ 1,906.71	
Financial review/audit	2,000.00	$ 2.00	ANNUAL	$ 4,000.00	
TOTAL DIRECT COSTS			0	$ 598,644.46	$ 598,644.46
In-kind construction			$ 66,000.00		
in-kind equipment			$ 64,000.00		
In kind technical			$ 5,000.00	$ -	
INDIRECT COSTS - 0_%				$ -	
				$ -	
TOTAL PROJECT COSTS				**$ 598,644.46**	

Budget Narrative

Technical assistance and indirect expenses received from the Preston NRCS field office are not included.

Salaries and Wages

Lyla Dettmer, or staff she directs, from the Franklin SWCD with confirmation of the Oxford reservoir and Irrigation Company will complete fiscal reporting responsibilities and Program Performance Reports. Project dedicated salaries including rates and hours are included for Lyla Dettmer, FSWCD District Manager and/or FSWCD staff. Lyla has worked for the Franklin SWCD since 1998. She has attended formal trainings and is certified in various natural resources. She has created the administration and financial procedures and policies that help ensure these federal grants meet all the requirements and simplifies the auditing process. The use of these policies substantially reduces the engineering cost because the engineer firm is not paying his administration employees and marking this wage up before billing us.

A project superintendent will oversee the field operations on a daily basis and will be compensated for the portion of his activities that are above and beyond his normal duties or specific to this project. The portion of the President's salary dedicated to the implementation of this project is included in the salaries and wages. Technical assistance is included in salaries. The entities providing this assistance except FSWCD are contributing this as in-kind service.

Administrative assistant provides duties requested by manager and superintendent. This may include filing, copies, etc. In addition she is our education specialist. We will include this project when we send our annual reports etc. We will do a fair display each august, and legislature display in Boise each February and will share our experience with other conservation districts at regional and state meetings.

Table 6- Payroll Calculations

			Lyla	Super-intendent	Chris	Hunter	Steve
Hourly rate			$36.00	$20.00	$11.50	$17.0	$18.0
FICA	0.062		2.23	1.24	0.74	1.05	1.12
Medicare	0.0145		.52	.29	.17	.25	.26
SUTA	0.00096		.03	.02	.67	.02	.02
Unemployment	0.03104		1.12	.62	.04	.53	.56
Worker comp	.0026		.09		.023		
Worker comp				.12		.77	.10
Annual leave	40 hrs	1.54	.69		.058		
Sick leave	40 hrs	1.54	.69		.48		
Health insurance	Month	579.5	3.62		5.75		
Retirement	400 month	400	2.50				
Holiday	10@ 8 hrs	3.08	1.39		.58		
			$48.89	$22.29	$20.84	$19.62	$20.06

Fringe Benefits
Fringe Benefit includes taxes and benefits have been included in the salary hourly rate.

Travel
Local travel cost associated with construction inspection and reporting includes 4,500 miles at 55 cents/mile. This is calculated by using the distance between our project manager and the project site. It is 20 miles one way. Using this calculation it is estimated we will travel 56 trips each year of the two year grant. Engineering cost includes travel specific to the engineering.

Equipment
Our definition of equipment is that it can be removed from the site after certification. Equipment rental will be comparable to the county average and is included in the construction figures. The irrigation system rate was calculated using the USDA-NRCS regional cost list. This is an approved cost calculated by NRCS economists to install a best management practices using rates from Idaho, Montana, Oregon, and Washington. The hydro equipment was compiled from manufacturer quotes on similar project in Utah.

Supplies
This category includes project specific supplies necessary for implementation of this project. These may be, but are not limited to office expenses, postage etc. The majority of these supplies will be utilized for reporting and education. This category includes project specific other expenses such as banking fees, etc.

Other
This project will have an annual financial review done by an independent auditor in accordance with the generally accepted government auditing standards covering financial audit and Idaho State Law title 22, chapter 27.

Cost associated with reporting are separated so that it is clear that we have budgeted for this important deliverable. This expense includes postage, computer use if reports required to be submitted on the internet, and office supplies. This task will include an estimated 39 hours at 48.89/hr rate.

(a) Construction Budget

Past WaterSMART pipeline project expenses were used in our budget creation. These award numbers are Preston Whitney Reservoir Company (05-FC-40-2405), Fairview Lateral (08-FC-40-2821) and a portion of the ARRA- Bear River (R09AC40R12). This budget was compiled by our administrative staff, consulting engineer, and technical staff. This project needed additional expertise for the hydro component. The engineer compiled a budget but we revised this based on the requirements of this grant ie- reporting and environmental and our experience with pipelines ie- pipe suppliers and contractors. In preparation we asked the local pipe supplier to give his across the counter price. This is always higher than a competitive bid.

The rationale behind the additional construction items such as appurtenant work and measuring devices is by using the company records and knowledge to count the number of connection and

times it by a cost. This cost is based on previous projects and included material, fabrication, installation etc.

We did our due diligence in selecting our consulting engineer. The irrigation company has a working relationship. Design engineering costs will be on a contractual basis using a typical industry average rate of 7% the construction budget. We typically use the ASCE guidelines for the type of project being considered. This project is considered as above average complexity. Before final design work is began the project will be fully defined we will develop a detailed scope of work and costs associated with the design, inspection, and construction management.

We have used both AA Hudson and Brian Allen surveying on previous projects. Using our knowledge and invoices from previous projects we estimated 60 hours will be needed. The hourly rate is $250 per hour for the survey team and his equipment.

If the owners do any of the work themselves we will document that we have no duplication of the same task. The irrigation company will provide a full time inspector and the engineer will provide periodic management and inspection including soil and concrete testing and start up services.

All purchases such as pipe, fittings, and hydro will be procured using a competitive bid process. The installation using public works contractors will also be selected using sealed completive bids.

Seminar
The Franklin SWCD will facilitate the arrangements for this meeting with specific tasks being assigned to staff, supervisors, and partners. The budget is as follows:

Table 7-Seminar Budget

Advertising	$200.00
Postage	$111.00
Facility Rental	$ 75.00
Education Material (development, printing)	$1,114.00
Guest Instructors (mileage, expense, and perdiem)	2,000.00
Hospitality Break/Lunch	$500.00
Total	**$4,000.00**

(b)Operation and Maintenance expenses

The Irrigation Company currently funds and performs all operation and maintenance involved with their system. When their water is co-mingled the operation and maintenance is shared equally by all entities. The company is committed to continue to fund and perform the necessary operations and maintenance. A net decrease in annual canal maintenance of approximately $5,000.00 is expected to result from the proposed project. This is based on past expenditures in the financials and experience with other pipeline projects.

Budget Form

Please see attached Budget Information (SF424A)

Resources

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Appendix

Map: Project Map: IDWR Water Right 13-2067 Map: Service Area;

Engineering: Pipeline Hydraulics, Energy Potential Power Generation; Water Saving Data

NEPA: Flowchart, Map: Soils; Map: Wetlands; Map: Species of Concern Species report; Franklin County Idaho, USFWS-natural resources of concerns

Rocky Mountain Power: Environmental Impact Calculator

Official Resolution- dated December 14, 2013.

Letter of commitment: Water District, Franklin SWCD, Jay Ransbottom

Letter of support: Franklin County Commissioners, Natural Resources Conservation Service

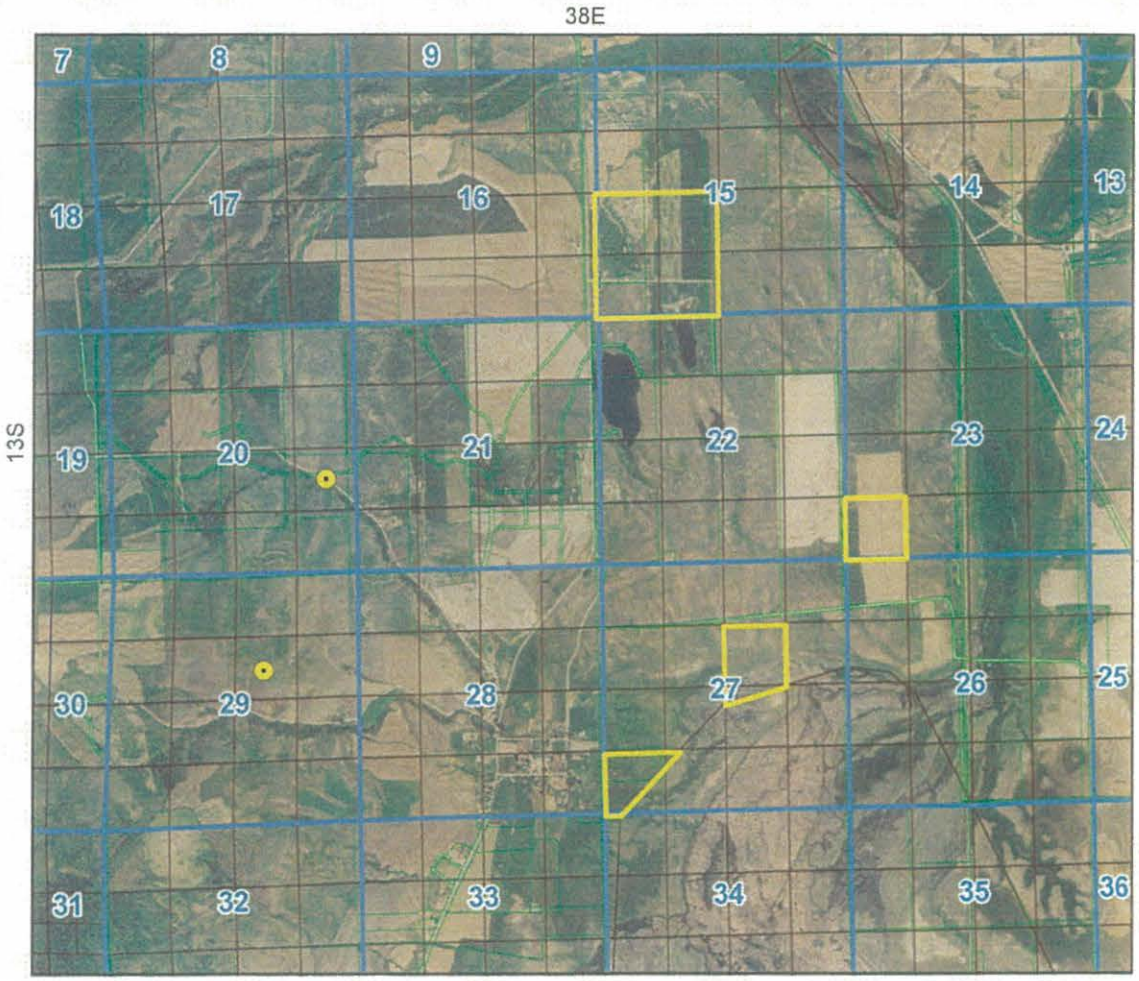
State of Idaho
Department of Water Resources

Water Right

13-2067

IRRIGATION

The map depicts the place of use for the water use listed above and point(s) of diversion of this right as currently derived from interpretations of the paper records and is used solely for illustrative purposes. Discrepancies between the computer representation and the pemanent document file will be resolved in favor of the actual water right documents in the water right file.



Map produced on January 06, 2014

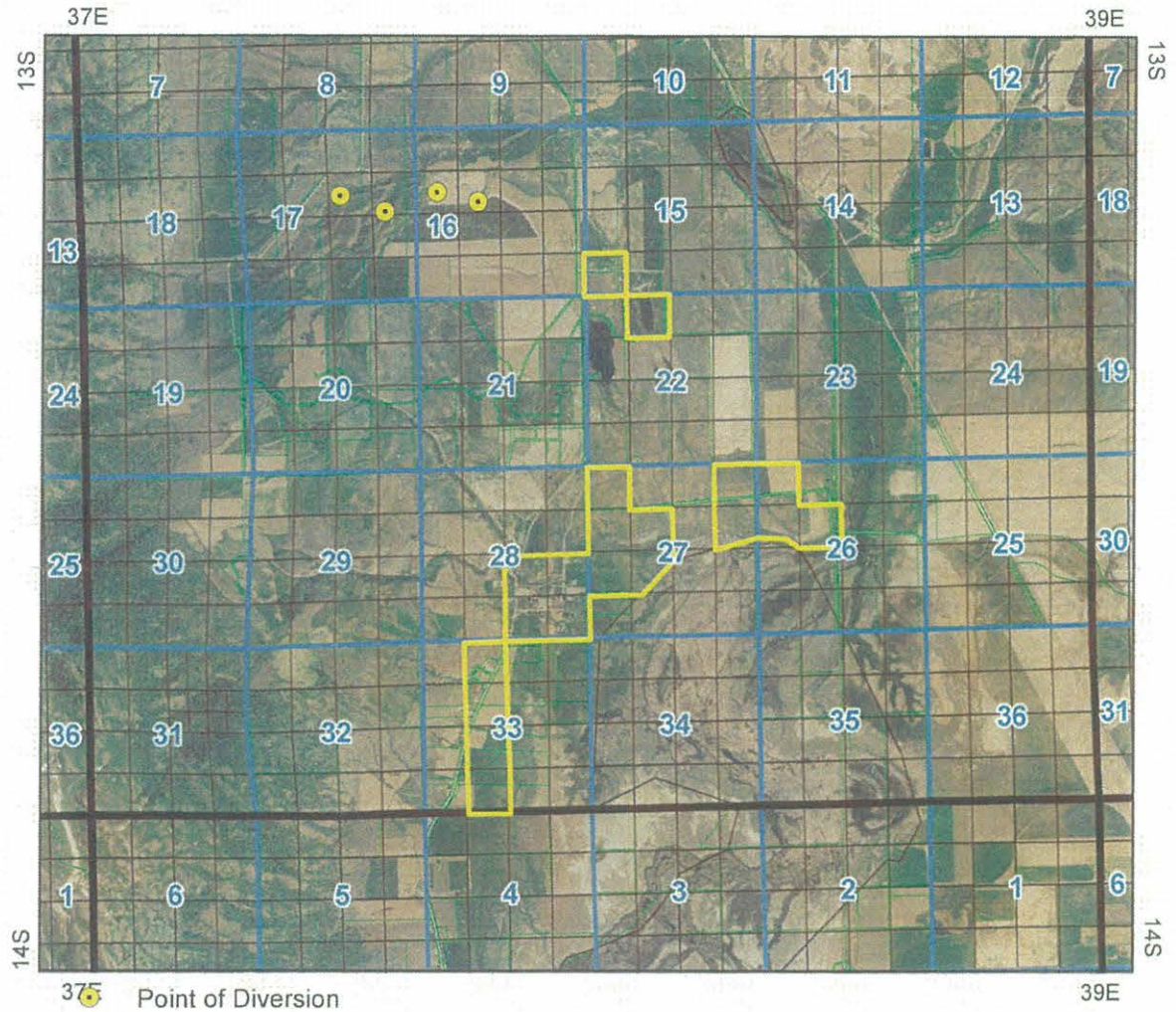
State of Idaho
Department of Water Resources

Water Right

13-2001

IRRIGATION

The map depicts the place of use for the water use listed above and point(s) of diversion of this right as currently derived from interpretations of the paper records and is used solely for illustrative purposes. Discrepancies between the computer representation and the pemanent document file will be resolved in favor of the actual water right documents in the water right file.



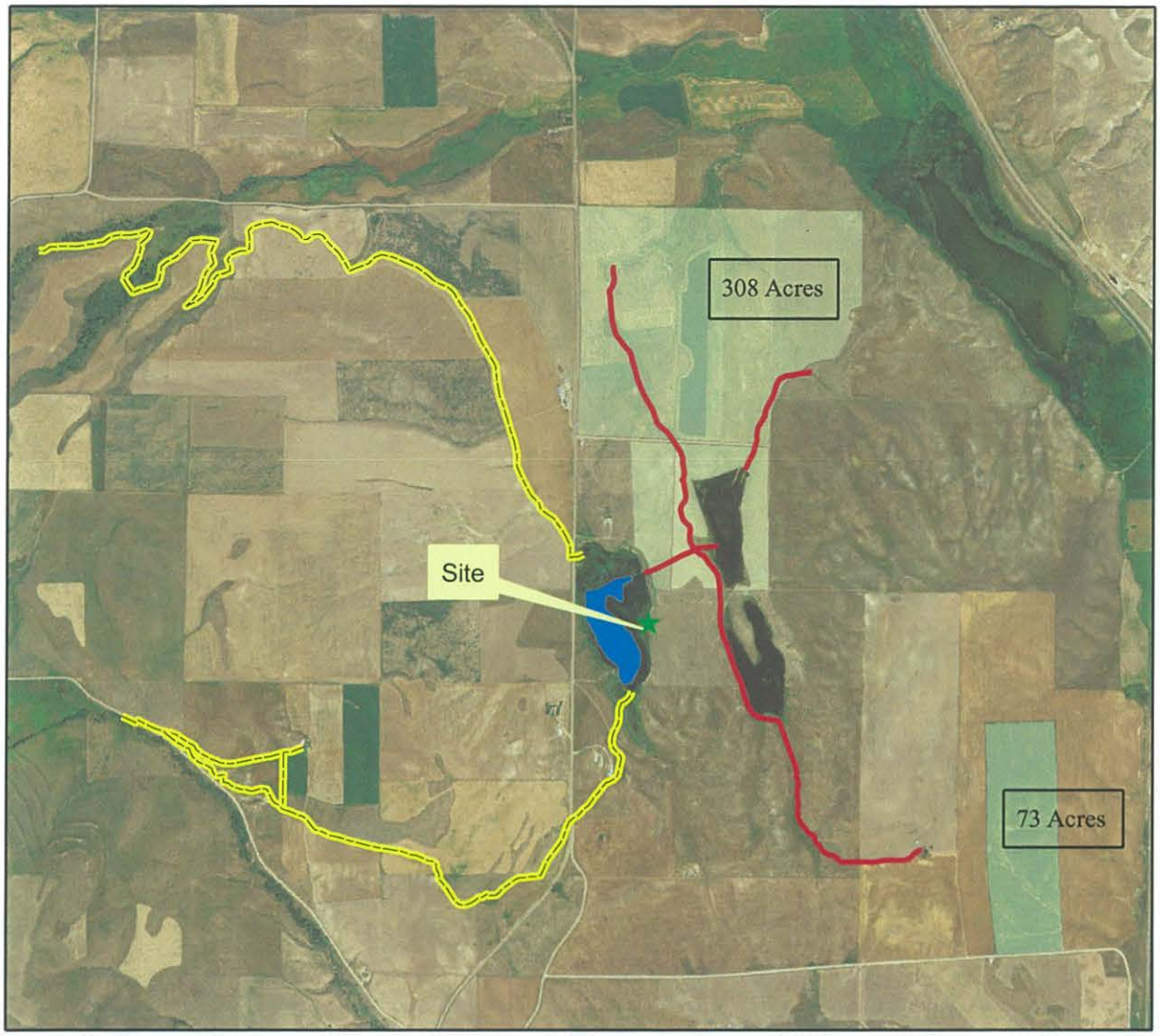
Point of Diversion
Place Of Use Boundary
Townships
PLS Sections
Quarter Quarters
Taxlots

0 0.5 1 2 Miles

N

Map produced on January 06, 2014

Oxford Reservoir and Irrigation Company Service Area



Date: 1/21/2014 User: lyla.dettmer

USGS Quadrangle: Oxford, Swan Lake Idaho

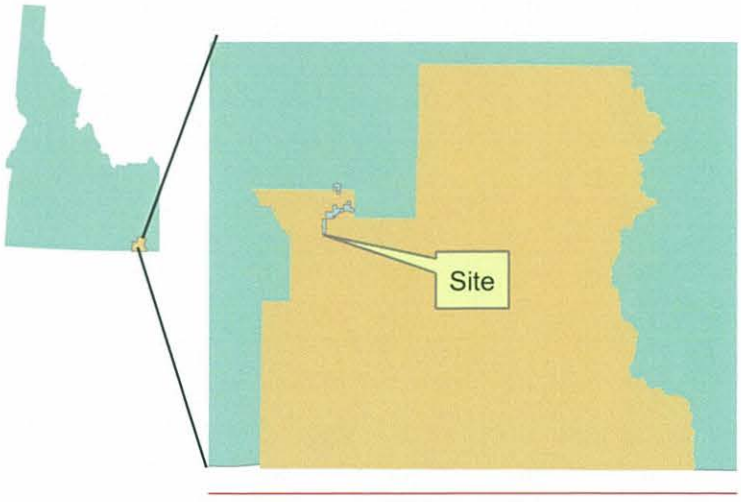
Township 13 South Range 38 East Sections 20, 29

0 850 1,700 3,400 5,100 6,800 Feet

N

Legend

- Wood Lateral
- Yearsley Lateral
- Combe Lateral
- Moyles Lateral
- Gooseberry Ditch
- Oxford Ditch
- Oxford Reservoir
- Oxford Irr Service Area



U. S. Department of Agriculture
Natural Resources Conservation Service
Pipeline Hydraulics
Hazen-Williams Formula

State: Idaho
By:

Project: Oxford
Date: January 6, 2014
Checked By:

Notes:

Design Inputs

Beginning Station	0	feet	Flow Rate	3.2	cfs =	1436.16	gpm
Ending Station	6958	feet	Total Available Head			11	feet

Pipe Alternatives

	Pipe Description	Pressure Rating		Inside Diameter		H-W C Factor
Alt #1	PIP SDR 51	100	psi	17.789	inches	150
Alternative #2	PIP SDR 41	100	psi	14.55	inches	150
Alternative #3		100	psi	11.64	inches	150

Minor Losses					Description
Entrance Conditions Loss	0.5	$K_{entrance}$	K_1	0.9	
Exit (Velocity Head) Loss	1	K_{exit}	K_2	0	
			K_3	0	
			K_4	0	

Design Outputs

	Alternative Pipe #1 Design	Alternative Pipe #2 Design	Alternative Pipe #3 Design	
Pipe Size	17.789	14.55	11.64	inches
Length	6958	6958	6958	feet
Flow Area	1.726	1.155	0.739	square feet
Flow	3.2	3.2	3.2	cfs
Flow Velocity	1.9	2.8	4.3	feet per second
Friction Loss	0.0006	0.0015	0.0044	feet per foot length
$K_{entrance}$	0.5	0.5	0.5	---
K_{exit}	1	1	1	---
Sum of Minor K's	0.9	0.9	0.9	---
Velocity Head	0.05	0.12	0.29	feet
Entrance Loss	0.03	0.06	0.15	feet
Minor Losses	0.05	0.11	0.26	feet
Line Loss	3.89	10.36	30.70	feet
Exit Loss	0.05	0.12	0.29	feet
Total Loss	4.02	10.64	31.40	feet
Available Head	11	11	11	feet
Enough Head?	YES	YES	NO	
Air Vent Spacing	4.8	5.9	7.4	feet

Oxford

STATE	Idaho		PROJECT						
BY	TR	DATE	1/6/2014	CHECKED BY	#REF!	DATE		JOB NO.	
SUBJECT	PIPELINE HYDRAULICS					SHEET		of	

XII. MAINLINE HYDRAULICS COMPUTAION SHEET

Minimum Required Psi from Pivot | Change Flow Rate Units | Estimated starting HGL Elevation

Station (ft)	Reach Length (ft)	Ground Elevation (ft)	Pipe Description (material, class, etc)	Inside Diameter (inches)	Reach Flow Rate (gpm)	Velocity (ft/s)	Friction Factor	Friction Loss Gradient	Minor Loss (ft)	Total Loss	HGL (ft)	Avail. Hd (ft.)	Pressure (psi)
0.00		5091.00							5.00		5091.00	0.00	0.00
	1158.00		PIP Plastic Irrigation Pipe, SDR	11.64	1436.00	4.33	150	0.00440668		10.10			
1158.00		5080.00							2.00		5080.90	0.90	0.39
	370.00		PIP Plastic Irrigation Pipe, SDR	11.64	1436.00	4.33	150	0.00440668		3.63			
1528.00		5075.00							0.00		5077.27	2.27	0.98
	83.00		PIP Plastic Irrigation Pipe, SDR	11.64	1436.00	4.33	150	0.00440668		0.37			
1611.00		5065.00							0.00		5076.90	11.90	5.15
	210.00		PIP Plastic Irrigation Pipe, SDR	11.64	1436.00	4.33	150	0.00440668		0.93			
1821.00		5062.00							0.00		5075.98	13.98	6.05
	420.00		PIP Plastic Irrigation Pipe, SDR	11.64	1436.00	4.33	150	0.00440668		1.85			
2241.00		5049.00							0.00		5074.12	25.12	10.88
	238.00		PIP Plastic Irrigation Pipe, SDR	11.64	1436.00	4.33	150	0.00440668		1.05			
2479.00		5049.00							0.00		5073.08	24.08	10.42
	1685.00		PIP Plastic Irrigation Pipe, SDR	11.64	1436.00	4.33	150	0.00440668		7.43			
4164.00		5022.00							0.00		5065.65	43.65	18.90
	513.00		PIP Plastic Irrigation Pipe, SDR	11.64	1436.00	4.33	150	0.00440668		2.26			
4677.00		5003.00							0.00		5063.39	60.39	26.14
	105.00		PIP Plastic Irrigation Pipe, SDR	11.64	1436.00	4.33	150	0.00440668		0.46			
4782.00		4993.00							0.00		5062.93	69.93	30.27
	130.00		PIP Plastic Irrigation Pipe, SDR	11.64	1436.00	4.33	150	0.00440668		0.57			
4912.00		4993.00							0.13		5062.35	69.35	30.02
	250.00		PIP Plastic Irrigation Pipe, SDR	11.64	1436.00	4.33	150	0.00440668		1.23			
5162.00		4993.00							0.00		5061.13	68.13	29.49
	167.00		PIP Plastic Irrigation Pipe, SDR	11.64	1436.00	4.33	150	0.00440668		0.74			
5329.00		4963.00							0.00		5060.39	97.39	42.16
	421.00		PIP Plastic Irrigation Pipe, SDR	11.64	1436.00	4.33	150	0.00440668		1.86			
5750.00		4957.00							0.00		5058.54	101.54	43.95
	196.00		PIP Plastic Irrigation Pipe, SDR	11.64	1436.00	4.33	150	0.00440668		0.86			
5946.00		4947.00							0.13		5057.67	110.67	47.91
	125.00		PIP Plastic Irrigation Pipe, SDR	11.64	1436.00	4.33	150	0.00440668		0.68			
6071.00		4944.00							0.00		5057.00	113.00	48.92
	751.00		PIP Plastic Irrigation Pipe, SDR	11.64	1436.00	4.33	150	0.00440668		3.31			
6822.00		4937.00							0.00		5053.69	116.69	50.51
	575.00		PIP Plastic Irrigation Pipe, SDR	11.64	1436.00	4.33	150	0.00440668		2.53			
7397.00		4937.00							0.00		5051.15	114.15	49.42
	236.00		PIP Plastic Irrigation Pipe, SDR	11.64	1436.00	4.33	150	0.00440668		1.04			
7633.00		4935.00							0.00		5050.11	115.11	49.83
	144.00		PIP Plastic Irrigation Pipe, SDR	11.64	1436.00	4.33	150	0.00440668		0.63			
7777.00		4934.00							0.00		5049.48	115.48	49.99
	278.00		PIP Plastic Irrigation Pipe, SDR	11.64	1436.00	4.33	150	0.00440668		1.23			
8055.00		4917.00							0.21		5048.25	131.25	56.82
	267.00		PIP Plastic Irrigation Pipe, SDR	11.64	1436.00	4.33	150	0.00440668		1.39			
8322.00		4917.00							0.00		5046.87	129.87	56.22
	409.00		PIP Plastic Irrigation Pipe, SDR	11.64	1436.00	4.33	150	0.00440668		1.80			
8731.00		4914.00							0.00		5045.06	131.06	56.74
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Yearsley

STATE	Idaho		PROJECT						
BY	TR	DATE	1/6/2014	CHECKED BY	#REF!	DATE		JOB NO.	
SUBJECT	PIPELINE HYDRAULICS					SHEET		of	

XII. MAINLINE HYDRAULICS COMPUTAION SHEET

Minimum Required Psi from Pivot | Change Flow Rate Units | Estimated starting HGL Elevation

Station (ft)	Reach Length (ft)	Ground Elevation (ft)	Pipe Description (material, class, etc)	Inside Diameter (inches)	Reach Flow Rate (gpm)	Velocity (ft/s)	Friction Factor	Friction Loss Gradient	Minor Loss (ft)	Total Loss	HGL (ft)	Avail. Hd (ft.)	Pressure (psi)
0.00		4881.00							5.00		4888.00	7.00	3.03
	20.00		PIP Plastic Irrigation Pipe, SDR	11.64	1436.00	4.33	150	0.00441037		5.09			
20.00		4880.90							2.00		4882.91	2.01	0.87
	620.00		PIP Plastic Irrigation Pipe, SDR	17.79	1436.00	1.85	150	0.0005589		2.35			
640.00		4880.00							0.00		4880.57	0.57	0.24
	60.00		PIP Plastic Irrigation Pipe, SDR	14.55	1436.00	2.77	150	0.00148756		0.09			
700.00		4879.00							0.00		4880.48	1.48	0.64
	483.00		PIP Plastic Irrigation Pipe, SDR	14.55	1436.00	2.77	150	0.00148756		0.72			
1183.00		4877.00							0.00		4879.76	2.76	1.19
	795.00		PIP Plastic Irrigation Pipe, SDR	14.55	1436.00	2.77	150	0.00148756		1.18			
1978.00		4875.00							0.00		4878.57	3.57	1.55
	1180.00		PIP Plastic Irrigation Pipe, SDR	14.55	1436.00	2.77	150	0.00148756		1.76			
3158.00		4874.00							0.00		4876.82	2.82	1.22
	200.00		PIP Plastic Irrigation Pipe, SDR	14.55	1436.00	2.77	150	0.00148756		0.30			
3358.00		4873.00							0.00		4876.52	3.52	1.52
	200.00		PIP Plastic Irrigation Pipe, SDR	14.55	1436.00	2.77	150	0.00148756		0.30			
3558.00		4872.00							0.00		4876.22	4.22	1.83
	790.00		PIP Plastic Irrigation Pipe, SDR	14.55	1436.00	2.77	150	0.00148756		1.18			
4348.00		4871.00							0.00		4875.05	4.05	1.75
	560.00		PIP Plastic Irrigation Pipe, SDR	14.55	1436.00	2.77	150	0.00148756		0.83			
4908.00		4870.00							0.00		4874.22	4.22	1.83
	185.00		PIP Plastic Irrigation Pipe, SDR	14.55	1436.00	2.77	150	0.00148756		0.28			
5093.00		4869.00							0.00		4873.94	4.94	2.14
	180.00		PIP Plastic Irrigation Pipe, SDR	14.55	1436.00	2.77	150	0.00148756		0.27			
5273.00		4869.00							0.00		4873.67	4.67	2.02
	170.00		PIP Plastic Irrigation Pipe, SDR	14.55	1436.00	2.77	150	0.00148756		0.25			
5443.00		4868.00							0.00		4873.42	5.42	2.35
	130.00		PIP Plastic Irrigation Pipe, SDR	14.55	1436.00	2.77	150	0.00148756		0.19			
5573.00		4867.00							0.00		4873.23	6.23	2.70
	150.00		PIP Plastic Irrigation Pipe, SDR	14.55	1436.00	2.77	150	0.00148756		0.22			
5723.00		4866.00							0.00		4873.00	7.00	3.03
	135.00		PIP Plastic Irrigation Pipe, SDR	14.55	1436.00	2.77	150	0.00148756		0.20			
5858.00		4865.00							0.00		4872.80	7.80	3.38
	260.00		PIP Plastic Irrigation Pipe, SDR	14.55	1436.00	2.77	150	0.00148756		0.39			
6118.00		4864.00							0.00		4872.42	8.42	3.64
	235.00		PIP Plastic Irrigation Pipe, SDR	14.55	1436.00	2.77	150	0.00148756		0.35			
6353.00		4864.00							0.00		4872.07	8.07	3.49
	80.00		PIP Plastic Irrigation Pipe, SDR	14.55	1436.00	2.77	150	0.00148756		0.12			
6433.00		4863.00							0.00		4871.95	8.95	3.87
	355.00		PIP Plastic Irrigation Pipe, SDR	14.55	1436.00	2.77	150	0.00148756		0.53			
6788.00		4862.00							0.00		4871.42	9.42	4.08
	170.00		PIP Plastic Irrigation Pipe, SDR	14.55	1436.00	2.77	150	0.00148756		0.25			
6958.00		4862.00							0.00		4871.17	9.17	3.97
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6958.00									0.00		#VALUE!	0.00	0.00
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6958.00									0.00		#VALUE!	0.00	0.00
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6958.00									0.00		#VALUE!	0.00	0.00
								#VALUE!		#VALUE!			

Station 0.00 minor losses = , Total K =		0.00		#VALUE!	0.00	0.00
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Wood

STATE	Idaho	PROJECT							
BY	TR	DATE	1/6/2014	CHECKED BY	#REF!	DATE		JOB NO.	
SUBJECT	PIPELINE HYDRAULICS					SHEET		of	

XII. MAINLINE HYDRAULICS COMPUTAION SHEET

Minimum Required Psi from Pivot

Change Flow Rate Units

Estimated starting HGL Elevation

Station (ft)	Reach Length (ft)	Ground Elevation (ft)	Pipe Description (material, class, etc)	Inside Diameter (inches)	Reach Flow Rate (gpm)	Velocity (ft/s)	Friction Factor	Friction Loss Gradient	Minor Loss (ft)	Total Loss	HGL (ft)	Avail. Hd (ft.)	Pressure (psi)
0.00		4880.00							5.00		4880.00	0.00	0.00
	150.00		PIP Plastic Irrigation Pipe, SDR	14.55	1436.00	2.77	150	0.00148756		5.22			
150.00		4872.00							2.00		4874.78	2.78	1.20
	175.00		PIP Plastic Irrigation Pipe, SDR	14.55	1436.00	2.77	150	0.00148756		2.26			
325.00		4872.00							0.00		4872.52	0.52	0.22
	80.00		PIP Plastic Irrigation Pipe, SDR	14.55	1436.00	2.77	150	0.00148756		0.12			
405.00		4872.00							0.00		4872.40	0.40	0.17
	160.00		PIP Plastic Irrigation Pipe, SDR	14.55	1436.00	2.77	150	0.00148756		0.24			
565.00		4865.00							0.00		4872.16	7.16	3.10
	175.00		PIP Plastic Irrigation Pipe, SDR	14.55	1436.00	2.77	150	0.00148756		0.26			
740.00		4860.00							0.00		4871.90	11.90	5.15
	605.00		PIP Plastic Irrigation Pipe, SDR	14.55	1436.00	2.77	150	0.00148756		0.90			
1345.00		4858.00							0.00		4871.00	13.00	5.63
	300.00		PIP Plastic Irrigation Pipe, SDR	14.55	1436.00	2.77	150	0.00148756		0.45			
1645.00		4857.00							0.00		4870.55	13.55	5.87
	250.00		PIP Plastic Irrigation Pipe, SDR	14.55	1436.00	2.77	150	0.00148756		0.37			
1895.00		4855.00							0.00		4870.18	15.18	6.57
	445.00		PIP Plastic Irrigation Pipe, SDR	14.55	1436.00	2.77	150	0.00148756		0.66			
2340.00		4850.00							0.00		4869.52	19.52	8.45
	575.00		PIP Plastic Irrigation Pipe, SDR	14.55	1436.00	2.77	150	0.00148756		0.86			
2915.00		4845.00							0.13		4868.66	23.66	10.24
	650.00		PIP Plastic Irrigation Pipe, SDR	14.55	1436.00	2.77	150	0.00148756		1.09			
3565.00		4842.00							0.00		4867.57	25.57	11.07
	340.00		PIP Plastic Irrigation Pipe, SDR	14.55	1436.00	2.77	150	0.00148756		0.51			
3905.00		4835.00							0.00		4867.07	32.07	13.88
	260.00		PIP Plastic Irrigation Pipe, SDR	14.55	1436.00	2.77	150	0.00148756		0.39			
4165.00		4832.00							0.00		4866.68	34.68	15.01
			PIP Plastic Irrigation Pipe, SDR				150	#VALUE!		#VALUE!			
4165.00									0.13		#VALUE!	0.00	0.00
			PIP Plastic Irrigation Pipe, SDR				150	#VALUE!		#VALUE!			
4165.00									0.00		#VALUE!	0.00	0.00
			PIP Plastic Irrigation Pipe, SDR				150	#VALUE!		#VALUE!			
4165.00									0.00		#VALUE!	0.00	0.00
			PIP Plastic Irrigation Pipe, SDR				150	#VALUE!		#VALUE!			
4165.00									0.00		#VALUE!	0.00	0.00
			PIP Plastic Irrigation Pipe, SDR				150	#VALUE!		#VALUE!			
4165.00									0.00		#VALUE!	0.00	0.00
			PIP Plastic Irrigation Pipe, SDR				150	#VALUE!		#VALUE!			
4165.00									0.00		#VALUE!	0.00	0.00
			PIP Plastic Irrigation Pipe, SDR				150	#VALUE!		#VALUE!			
4165.00									0.21		#VALUE!	0.00	0.00
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4165.00									0.00		#VALUE!	0.00	0.00
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4165.00									0.00		#VALUE!	0.00	0.00
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Station 0.00 minor losses = , Total K =			0.00	#VALUE!	0.00	0.00
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Combe

STATE	Idaho	PROJECT						
BY	TR	DATE	1/6/2014	CHECKED BY	#REF!	DATE		JOB NO.
SUBJECT	PIPELINE HYDRAULICS					SHEET		of

XII. MAINLINE HYDRAULICS COMPUTAION SHEET

Minimum Required Psi from Pivot

Change Flow Rate Units

Estimated starting HGL Elevation

Station (ft)	Reach Length (ft)	Ground Elevation (ft)	Pipe Description (material, class, etc)	Inside Diameter (inches)	Reach Flow Rate (gpm)	Velocity (ft/s)	Friction Factor	Friction Loss Gradient	Minor Loss (ft)	Total Loss	HGL (ft)	Avail. Hd (ft.)	Pressure (psi)
0.00		4872.00							5.00		4876.00	4.00	1.73
	150.00		PIP Plastic Irrigation Pipe, SDR	14.55	1436.00	2.77	150	0.00148756		5.22			
150.00		4870.00							2.00		4870.78	0.78	0.34
	240.00		PIP Plastic Irrigation Pipe, SDR	14.55	1436.00	2.77	150	0.00148756		2.36			
390.00		4868.00							0.00		4868.42	0.42	0.18
	230.00		PIP Plastic Irrigation Pipe, SDR	14.55	1436.00	2.77	150	0.00148756		0.34			
620.00		4865.00							0.00		4868.08	3.08	1.33
	170.00		PIP Plastic Irrigation Pipe, SDR	14.55	1436.00	2.77	150	0.00148756		0.25			
790.00		4864.00							0.00		4867.82	3.82	1.66
	185.00		PIP Plastic Irrigation Pipe, SDR	14.55	1436.00	2.77	150	0.00148756		0.28			
975.00		4863.00							0.00		4867.55	4.55	1.97
	130.00		PIP Plastic Irrigation Pipe, SDR	14.55	1436.00	2.77	150	0.00148756		0.19			
1105.00		4862.00							0.00		4867.36	5.36	2.32
	220.00		PIP Plastic Irrigation Pipe, SDR	14.55	1436.00	2.77	150	0.00148756		0.33			
1325.00		4861.00							0.00		4867.03	6.03	2.61
	140.00		PIP Plastic Irrigation Pipe, SDR	14.55	1436.00	2.77	150	0.00148756		0.21			
1465.00		4860.00							0.00		4866.82	6.82	2.95
	125.00		PIP Plastic Irrigation Pipe, SDR	14.55	1436.00	2.77	150	0.00148756		0.19			
1590.00									0.00		4866.63	0.00	0.00
			PIP Plastic Irrigation Pipe, SDR				150	#VALUE!		#VALUE!			
1590.00									0.13		#VALUE!	0.00	0.00
			PIP Plastic Irrigation Pipe, SDR				150	#VALUE!		#VALUE!			
1590.00									0.00		#VALUE!	0.00	0.00
			PIP Plastic Irrigation Pipe, SDR				150	#VALUE!		#VALUE!			
1590.00									0.00		#VALUE!	0.00	0.00
			PIP Plastic Irrigation Pipe, SDR				150	#VALUE!		#VALUE!			
1590.00									0.00		#VALUE!	0.00	0.00
			PIP Plastic Irrigation Pipe, SDR				150	#VALUE!		#VALUE!			
1590.00									0.13		#VALUE!	0.00	0.00
			PIP Plastic Irrigation Pipe, SDR				150	#VALUE!		#VALUE!			
1590.00									0.00		#VALUE!	0.00	0.00
			PIP Plastic Irrigation Pipe, SDR				150	#VALUE!		#VALUE!			
1590.00									0.00		#VALUE!	0.00	0.00
			PIP Plastic Irrigation Pipe, SDR				150	#VALUE!		#VALUE!			
1590.00									0.00		#VALUE!	0.00	0.00
			PIP Plastic Irrigation Pipe, SDR				150	#VALUE!		#VALUE!			
1590.00									0.00		#VALUE!	0.00	0.00
			PIP Plastic Irrigation Pipe, SDR				150	#VALUE!		#VALUE!			
1590.00									0.00		#VALUE!	0.00	0.00
			PIP Plastic Irrigation Pipe, SDR				150	#VALUE!		#VALUE!			
1590.00									0.21		#VALUE!	0.00	0.00
								#VALUE!		#VALUE!			
1590.00									0.00		#VALUE!	0.00	0.00
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1590.00									0.00		#VALUE!	0.00	0.00
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1590.00									0.00		#VALUE!	0.00	0.00
								#VALUE!		#VALUE!			
1590.00									0.00		#VALUE!	0.00	0.00
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Station 0.00 minor losses = , Total K =		0.00		#VALUE!	0.00	0.00
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Meyles

STATE	Idaho	PROJECT							
BY	TR	DATE	1/6/2014	CHECKED BY	#REF!	DATE		JOB NO.	
SUBJECT	PIPELINE HYDRAULICS					SHEET		of	

XII. MAINLINE HYDRAULICS COMPUTAION SHEET

Minimum Required Psi from Pivot

Change Flow Rate Units

Estimated starting HGL Elevation

Station (ft)	Reach Length (ft)	Ground Elevation (ft)	Pipe Description (material, class, etc)	Inside Diameter (inches)	Reach Flow Rate (gpm)	Velocity (ft/s)	Friction Factor	Friction Loss Gradient	Minor Loss (ft)	Total Loss	HGL (ft)	Avail. Hd (ft.)	Pressure (psi)
0.00		4880.00							5.00		4880.00	0.00	0.00
	140.00		PIP Plastic Irrigation Pipe, SDR	14.55	1436.00	2.77	150	0.00148756		5.21			
140.00		4865.00							2.00		4874.79	9.79	4.24
			PIP Plastic Irrigation Pipe, SDR				150	#VALUE!		#VALUE!			
140.00									0.00		#VALUE!	0.00	0.00
			PIP Plastic Irrigation Pipe, SDR				150	#VALUE!		#VALUE!			
140.00									0.00		#VALUE!	0.00	0.00
			PIP Plastic Irrigation Pipe, SDR				150	#VALUE!		#VALUE!			
140.00									0.00		#VALUE!	0.00	0.00
			PIP Plastic Irrigation Pipe, SDR				150	#VALUE!		#VALUE!			
140.00									0.00		#VALUE!	0.00	0.00
			PIP Plastic Irrigation Pipe, SDR				150	#VALUE!		#VALUE!			
140.00									0.00		#VALUE!	0.00	0.00
			PIP Plastic Irrigation Pipe, SDR				150	#VALUE!		#VALUE!			
140.00									0.00		#VALUE!	0.00	0.00
			PIP Plastic Irrigation Pipe, SDR				150	#VALUE!		#VALUE!			
140.00									0.00		#VALUE!	0.00	0.00
			PIP Plastic Irrigation Pipe, SDR				150	#VALUE!		#VALUE!			
140.00									0.00		#VALUE!	0.00	0.00
			PIP Plastic Irrigation Pipe, SDR				150	#VALUE!		#VALUE!			
140.00									0.13		#VALUE!	0.00	0.00
			PIP Plastic Irrigation Pipe, SDR				150	#VALUE!		#VALUE!			
140.00									0.00		#VALUE!	0.00	0.00
			PIP Plastic Irrigation Pipe, SDR				150	#VALUE!		#VALUE!			
140.00									0.00		#VALUE!	0.00	0.00
			PIP Plastic Irrigation Pipe, SDR				150	#VALUE!		#VALUE!			
140.00									0.00		#VALUE!	0.00	0.00
			PIP Plastic Irrigation Pipe, SDR				150	#VALUE!		#VALUE!			
140.00									0.13		#VALUE!	0.00	0.00
			PIP Plastic Irrigation Pipe, SDR				150	#VALUE!		#VALUE!			
140.00									0.00		#VALUE!	0.00	0.00
			PIP Plastic Irrigation Pipe, SDR				150	#VALUE!		#VALUE!			
140.00									0.00		#VALUE!	0.00	0.00
			PIP Plastic Irrigation Pipe, SDR				150	#VALUE!		#VALUE!			
140.00									0.00		#VALUE!	0.00	0.00
			PIP Plastic Irrigation Pipe, SDR				150	#VALUE!		#VALUE!			
140.00									0.00		#VALUE!	0.00	0.00
			PIP Plastic Irrigation Pipe, SDR				150	#VALUE!		#VALUE!			
140.00									0.00		#VALUE!	0.00	0.00
			PIP Plastic Irrigation Pipe, SDR				150	#VALUE!		#VALUE!			
140.00									0.21		#VALUE!	0.00	0.00
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140.00									0.00		#VALUE!	0.00	0.00
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								#VALUE!		#VALUE!			
140.00									0.00		#VALUE!	0.00	0.00
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Station 0.00 minor losses = , Total K =		0.00		#VALUE!	0.00	0.00
	#VALUE!		#VALUE!			
#VALUE!		0.21		#VALUE!	0.00	0.00
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			#VALUE!	#VALUE!

Pipeline Hydroelectric Project
Potential Power Generation

Date	2008 Monthly Flow (ac ft)	2009 Monthly Flow (ac ft)	2010 Monthly Flow (ac ft)	Monthly Ave Flow (ac ft)	Monthly Ave Flow (cfs)	Head Loss (ft)	Net Head (ft)	Power Output (KW)	Power Generated (kWh)
January									
February									
March									
April									
May									
June	124.69	119.51	129.91	124.70	2.10	0.00	80.00	9.09	6,633
July	288.64	276.65	300.72	288.67	4.85	0.00	80.00	21.03	15,353
August	274.84	263.42	286.34	274.87	4.62	0.00	80.00	20.03	14,619
September	115.18	110.39	120.00	115.19	1.94	0.00	80.00	8.39	6,127
October	14.64	14.03	15.25	14.64	0.25	0.00	80.00	0.00	0
November									
December									
Total	818.00	784.00	852.22	818.07				Total:	42,731

Gross Head	80 ft	Pipe Length	N/A	Time	730 hrs/month
Pipe Diameter	N/A	Hazen Williams	N/A	Efficiency	64%

$HL = [Q / (0.432 \times C \times D^{2.63})]^{1/0.54}$

Power Output = Eff. x [(Q x H) / 11.81]

Oxford Reservoir and Irrigation Company

Oxford Creek Ditch and Lateral Project

Water Savings Data

11/6/2013

In Cooperation with the

Franklin Soil and Water Conservation District

water saving data

	acres served	existing ditch feet	existing ditch miles	soil type
Moyles	117.00	140.00	0.02	Gravelly silt loam
Combe	61.00	1,590.00	0.03	Gravelly silt loam
Wood	93.00	4,220.00	0.80	Gravelly silt loam
Yearsley	73.00	6,958.00	1.30	Gravelly silt loam
	344.00	12,908.00	2.15	

Current use		cfs	AFA
oxford ditch delivery		3.20	1,140.48
Moyles		0.29	103.36
Wood		0.17	60.59
Yearsley		0.50	178.20
Combe	1.09	0.13	46.33

Water Saved	cfs	seepage AFA**	onfarm 30% AFA	distribution 1/24 AFA	evaporation 10% AFA	total AFA
oxford ditch	2.048	729.91	-		72.99	802.90
laterals	0.6976	248.62	1.40	2.52	24.86	277.41
	2.7456	978.53	1.40	2.52	97.85	1,080.31

*AFA=180 days of irrigation

** Water loss calculations

Seepage 64% verified and modeled by handheld doppler device

X-section 1	Waypoint # Diversion box						Latitude:					Longitude:						Photos:			
left Bank@ Bankfull																					Right Bank@
Tape Distance (ft)	0	1	1.5	2	2.7																Bankfull
Water Depth (ft)	0.00	0.25	0.25	0.20	0.00																Avg Depth: 0.140
Bankfull Depth (ft)																					Avg Depth: #####
Water Velocity(cfs)	0.00	0.65	1.83	1.28	0.00																Total cfs: 0.504
Bed particle Size(mm)																					D50: #####
Valley Length:							Channel length:					Channel Sinuosity: ####									
Water Surface Slope: 0.00							Channel Evolution Stage:					Wetted Channel Width:						Canopy Cover:			
Upstream 50ft Water surface elevation							Down Stream 50ft Water surface elevation					Bankfull Channel Width:						Water Max Depth(ft): 0.25			
												Width of Flood Prone Area:						Bankfull Max Depth(ft): 0.0			

X-section 2	Waypoint # USFWS Div box						Latitude:					Longitude:						Photos:			
left Bank@ Bankfull																					Right Bank@
Tape Distance (ft)	0	0.8	1.7																		Bankfull
Water Depth (ft)	0.0	0.2	0.0																		Avg Depth: 0.067
Bankfull Depth (ft)																					Avg Depth: #####
Water Velocity(cfs)	0.00	1.82	0.00																		Total cfs: 0.309
Bed Particle Size(mm)																					D50: #####
Valley Length:							Channel length:					Channel Sinuosity: ####									
Water Surface Slope:							Channel Evolution Stage:					Wetted Channel Width:						Canopy Cover:			
Upstream 50ft Water surface elevation							Down Stream 50ft Water surface elevation					Bankfull Channel Width:						Water Max Depth(ft): 0.2			
												Width of Flood Prone Area:						Bankfull Max Depth(ft): 0.0			

X-section 3	Waypoint # RCS Grice						Latitude:					Longitude:						Photos:			
left Bank@ Bankfull																					Right Bank@
Tape Distance (ft)	0	0.8	1.7																		Bankfull
Water Depth (ft)	0.0	0.15	0.0																		Avg Depth: 0.050
Bankfull Depth (ft)																					Avg Depth: #####
Water Velocity(cfs)	0.00	1.45	0.00																		Total cfs: 0.185
Bed particle Size(mm)																					D50: #####
Valley Length:							Channel length:					Channel Sinuosity: ####									
Water Surface Slope: 0.00							Channel Evolution Stage:					Wetted Channel Width:						Canopy Cover:			
Upstream 50ft Water surface elevation							Down Stream 50ft Water surface elevation					Bankfull Channel Width:						Water Max Depth(ft): 0.2			
												Width of Flood Prone Area:						Bankfull Max Depth(ft): 0.0			

Right and Left banks are looking down stream

Bankfull X-section Area = Bankfull Width x Bankfull Mean Depth, Channel Sinuosity = Stream Length / Valley Length, Width of flood-prone area is measured at 2 times the max depth at Bankfull

Width / Depth Ratio = Bankfull Width / Bankfull Depth, D50 = the mean diameter of channel bed materials, Entrenchment Ratio = Width of flood Prone Area/ Bankfull Width

	Distance (ft)	Depth (ft)	Velocity 1 (ft/s)	Velocity 2 (ft/s)	Average Velosity	Cell Width	Depth (ft)	Q (cell)	Q Total (ft3/s) cfs	% of total
LWE	0	0.0	0.0		0.00	0.5	0.0	0.000	0.504	0.00
	1	0.3	0.7		0.65	0.75	0.3	0.122		24.17
	1.5	0.3	1.8		1.83	0.5	0.3	0.229		45.37
	2	0.2	1.3		1.28	0.6	0.2	0.154		30.46
	2.7	0.0	0.0		0.00	-1	0.0	0.000		0.00
	0	0.0	0.0		0.00	-1.35	0.0	0.000		0.00
	0	0.0	0.0		0.00	0	0.0	0.000		0.00
	0	0.0	0.0		0.00	0	0.0	0.000		0.00
	0	0.0	0.0		0.00	0	0.0	0.000		0.00
	0	0.0	0.0		0.00	0	0.0	0.000		0.00
	0	0.0	0.0		0.00	0	0.0	0.000		0.00
	0	0.0	0.0		0.00	0	0.0	0.000		0.00
	0	0.0	0.0		0.00	0	0.0	0.000		0.00
	0	0.0	0.0		0.00	0	0.0	0.000		0.00
	0	0.0	0.0		0.00	0	0.0	0.000		0.00
	0	0.0	0.0		0.00	0	0.0	0.000		0.00
	0	0.0	0.0		0.00	0	0.0	0.000		0.00
	0	0.0	0.0		0.00	0	0.0	0.000		0.00
	0	0.0	0.0		0.00	0	0.0	0.000		0.00
RWE	0	0.0	0.0		0.00	0	0.0	0.000		0.00

	Distance (ft)	Depth (ft)	Velocity 1 (ft/s)	Velocity 2 (ft/s)	Average Velosity	Cell Width	Depth (ft)	Q (cell)	Q Total (ft3/s) cfs	% of total
LWE	0	0.0	0.0		0.00	0.4	0.0	0.000	0.309	0.00
	0.8	0.2	1.8		1.82	0.85	0.2	0.309		100.00
	1.7	0.0	0.0		0.00	-0.4	0.0	0.000		0.00
	0	0.0	0.0		0.00	-0.85	0.0	0.000		0.00
	0	0.0	0.0		0.00	0	0.0	0.000		0.00
	0	0.0	0.0		0.00	0	0.0	0.000		0.00
	0	0.0	0.0		0.00	0	0.0	0.000		0.00
	0	0.0	0.0		0.00	0	0.0	0.000		0.00
	0	0.0	0.0		0.00	0	0.0	0.000		0.00
	0	0.0	0.0		0.00	0	0.0	0.000		0.00
	0	0.0	0.0		0.00	0	0.0	0.000		0.00
	0	0.0	0.0		0.00	0	0.0	0.000		0.00
	0	0.0	0.0		0.00	0	0.0	0.000		0.00
	0	0.0	0.0		0.00	0	0.0	0.000		0.00
	0	0.0	0.0		0.00	0	0.0	0.000		0.00
	0	0.0	0.0		0.00	0	0.0	0.000		0.00
	0	0.0	0.0		0.00	0	0.0	0.000		0.00
	0	0.0	0.0		0.00	0	0.0	0.000		0.00
	0	0.0	0.0		0.00	0	0.0	0.000		0.00
RWE	0	0.0	0.0		0.00	0	0.0	0.000		0.00

	Distance (ft)	Depth (ft)	Velocity 1 (ft/s)	Velocity 2 (ft/s)	Average Velosity	Cell Width	Depth (ft)	Q (cell)	Q Total (ft3/s) cfs	% of total
LWE	0	0.0	0.0		0.00	0.4	0.0	0.000	0.185	0.00
	0.8	0.2	1.5		1.45	0.85	0.2	0.185		100.00
	1.7	0.0	0.0		0.00	-0.4	0.0	0.000		0.00
	0	0.0	0.0		0.00	-0.85	0.0	0.000		0.00
	0	0.0	0.0		0.00	0	0.0	0.000		0.00
	0	0.0	0.0		0.00	0	0.0	0.000		0.00
	0	0.0	0.0		0.00	0	0.0	0.000		0.00
	0	0.0	0.0		0.00	0	0.0	0.000		0.00
	0	0.0	0.0		0.00	0	0.0	0.000		0.00
	0	0.0	0.0		0.00	0	0.0	0.000		0.00
	0	0.0	0.0		0.00	0	0.0	0.000		0.00
	0	0.0	0.0		0.00	0	0.0	0.000		0.00
	0	0.0	0.0		0.00	0	0.0	0.000		0.00
	0	0.0	0.0		0.00	0	0.0	0.000		0.00
	0	0.0	0.0		0.00	0	0.0	0.000		0.00
	0	0.0	0.0		0.00	0	0.0	0.000		0.00
	0	0.0	0.0		0.00	0	0.0	0.000		0.00
	0	0.0	0.0		0.00	0	0.0	0.000		0.00
	0	0.0	0.0		0.00	0	0.0	0.000		0.00
RWE	0	0.0	0.0		0.00	0	0.0	0.000		0.00

Oxford Res Volume as of 6/12/2013

Depth 6ft
Usable Water Depth: 5ft
Usable Water Volume: 51.04 Acre/ft

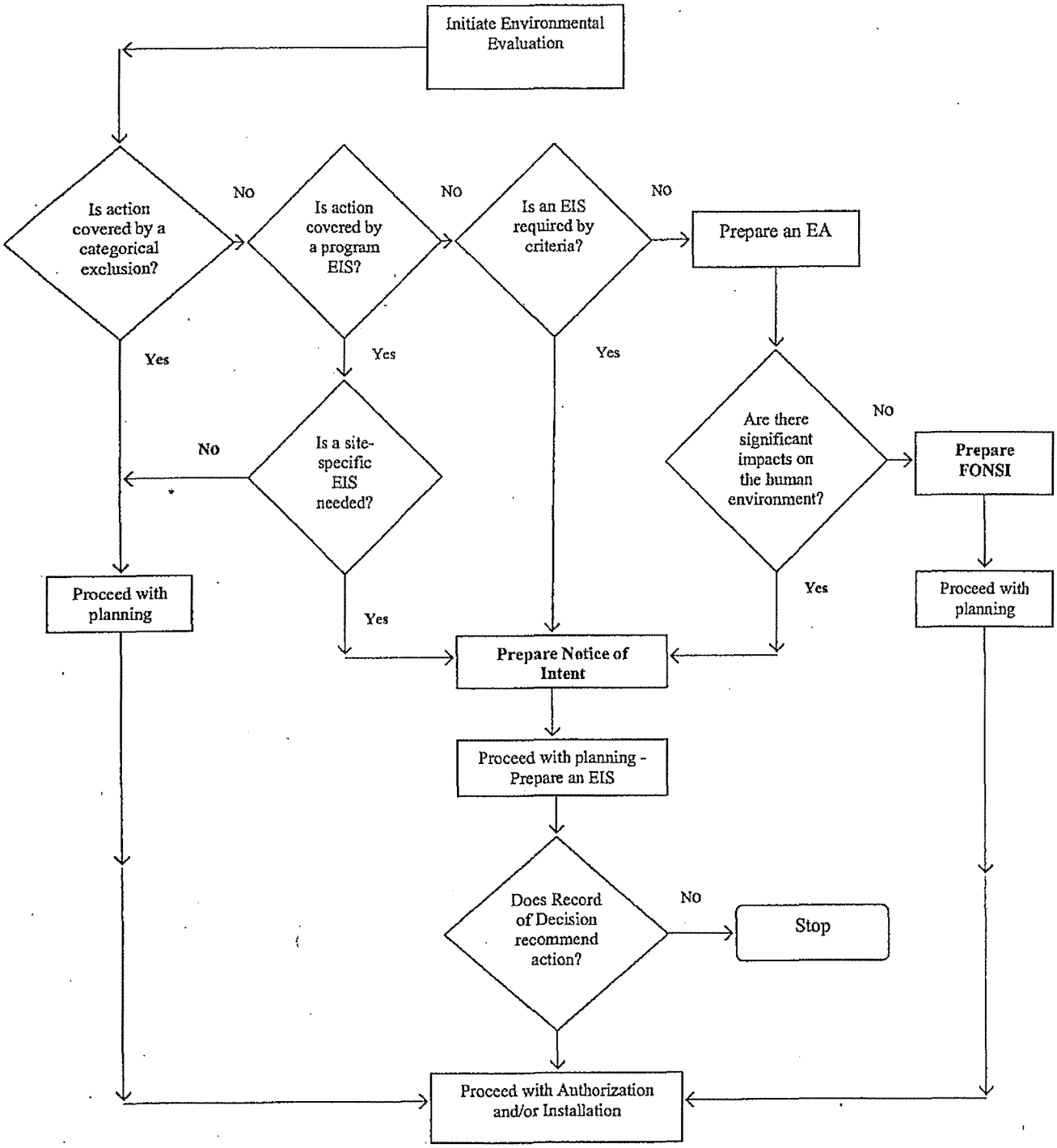
Gallons in an Acre/ft - 325,851

1 Bird/24hr/7.5 gpm nozzle= 10,800 gal/day

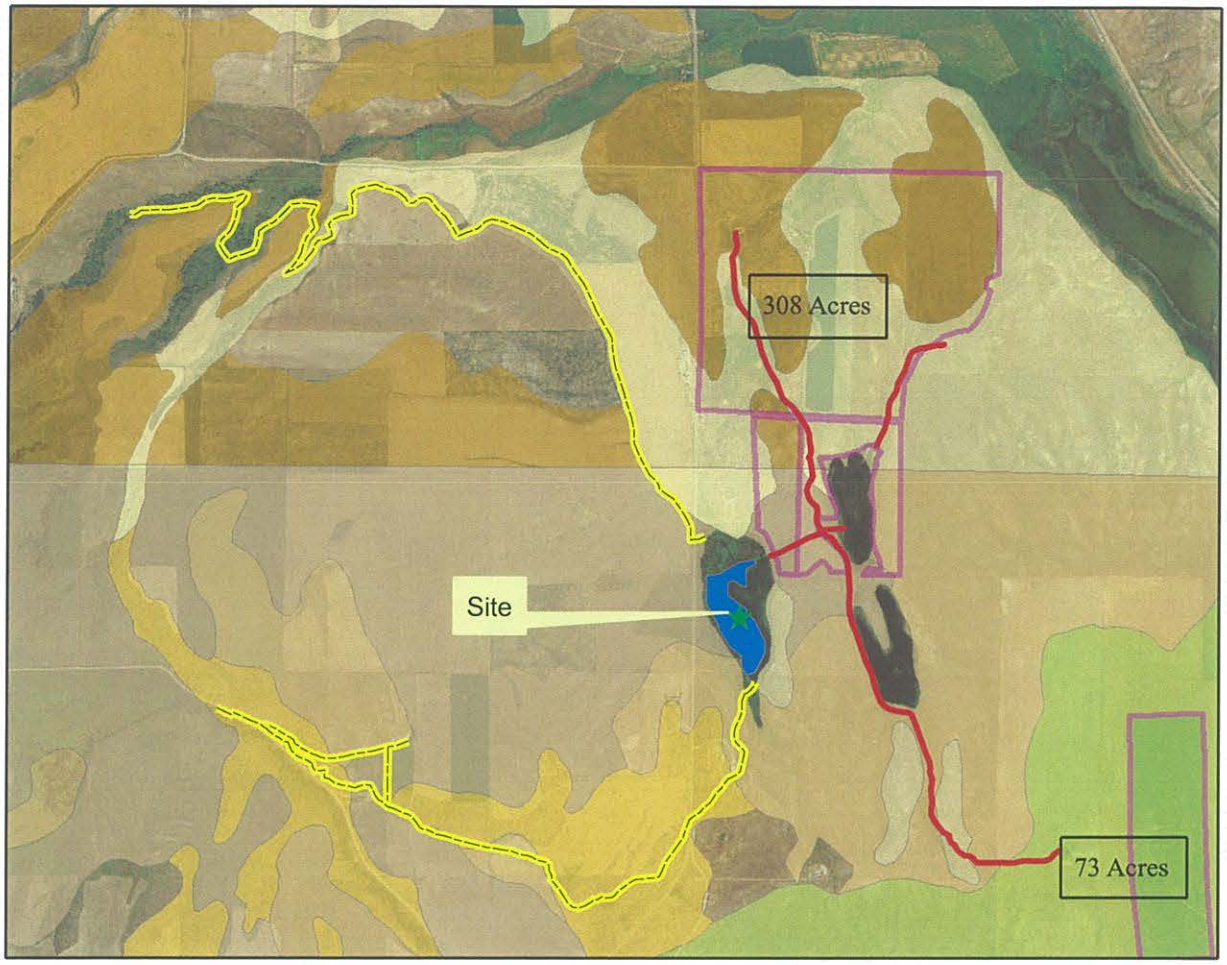
1 CFS for 24 hr = 1.98 acre/ft

	Shares	Acre/ft/share	Totol Acre/ft Available	Gals	Birds/24hr	1/4 mile
Dan & Betty Joe Combe	40	0.15	6	1955106	181.03	5.657135
Dan Wood	53.75	0.15	8.0625	2627173.69	243.26	7.601776
Brett Yearsley	155.5	0.15	23.325	7600474.58	703.75	21.99211
Hunter Moyles	88.75	0.15	13.3125	4337891.44	401.66	12.55177
Total	338		50.7			

610.12 NEPA Flowchart



Oxford Reservoir and Irrigation Company
Soils



Date: 1/22/2014 User: lyla.dettmer

USGS Quadrangle: Oxford, Swan Lake Idaho

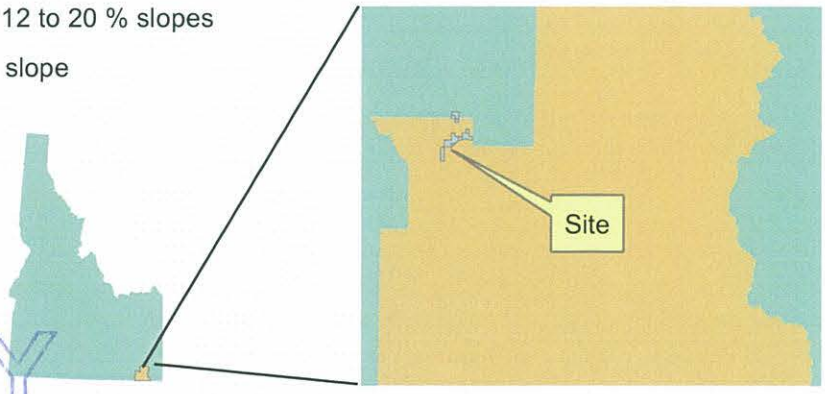
Township 13 South Range 38 East Sections 20, 29

N

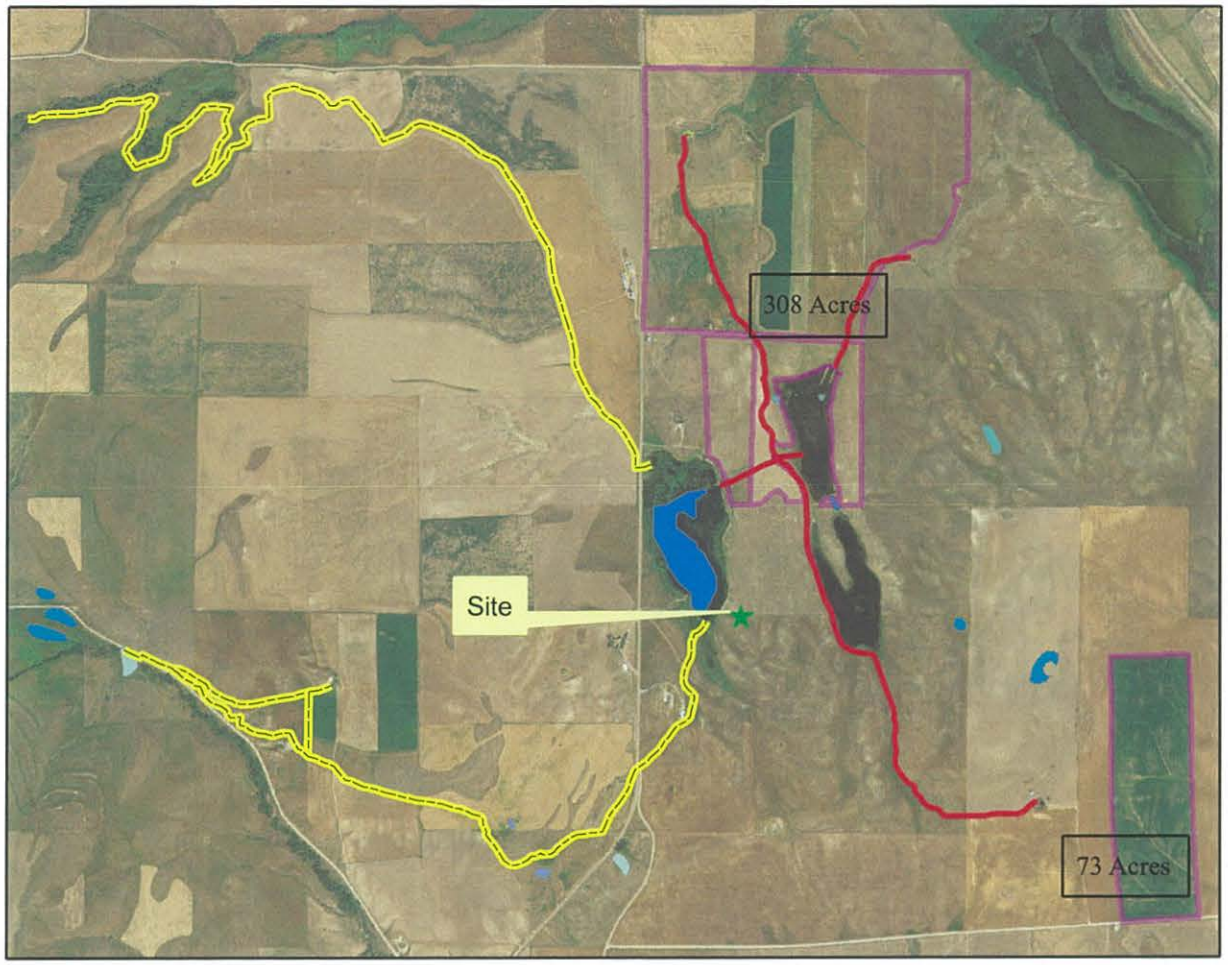
0 850 1,700 3,400 5,100 6,800 Feet

Legend

- 49-Hades-Lanoak complex, 4 to 12 % slopes
- 55-Hondoho-Hades complex, 4 to 12 % slopes
- 105-Oxford-Banida complex, 4 to 12 % slopes
- 144-Vitale-Bergquist-Rock outcrop complex, 30 to 60 % slopes
- 162-Yeates Hollow-Manila-Softback complex, 12 to 40 % slopes
- 38-Cloudless-Hades-Howcan complex, 4 to 8 % slopes
- 39-Cloudless-Hades-Howcan complex, 12 to 20 % slopes
- 53-Hondoho Hades complex, 4 to 12 % slope
- Laterals
- Gooseberry Ditch
- Oxford Ditch
- Oxford Reservoir
- Oxford Irr Service Area



Oxford Reservoir and Irrigation Company Wetlands



Date: 1/22/2014 User: lyla.dettmer

USGS Quadrangle: Oxford, Swan Lake Idaho

Township 13 South Range 38 East Sections 20, 29

0 750 1,500 3,000 4,500 6,000 Feet

N

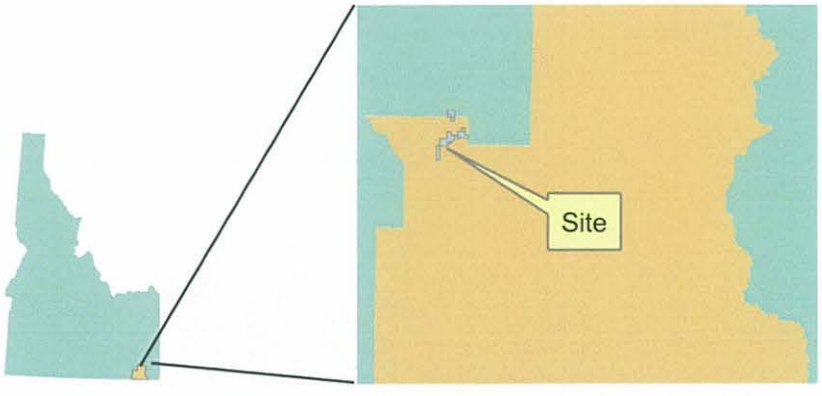
Legend

- Laterals
- Gooseberry Ditch
- Oxford Ditch
- Oxford Reservoir
- Oxford Irr Service Area

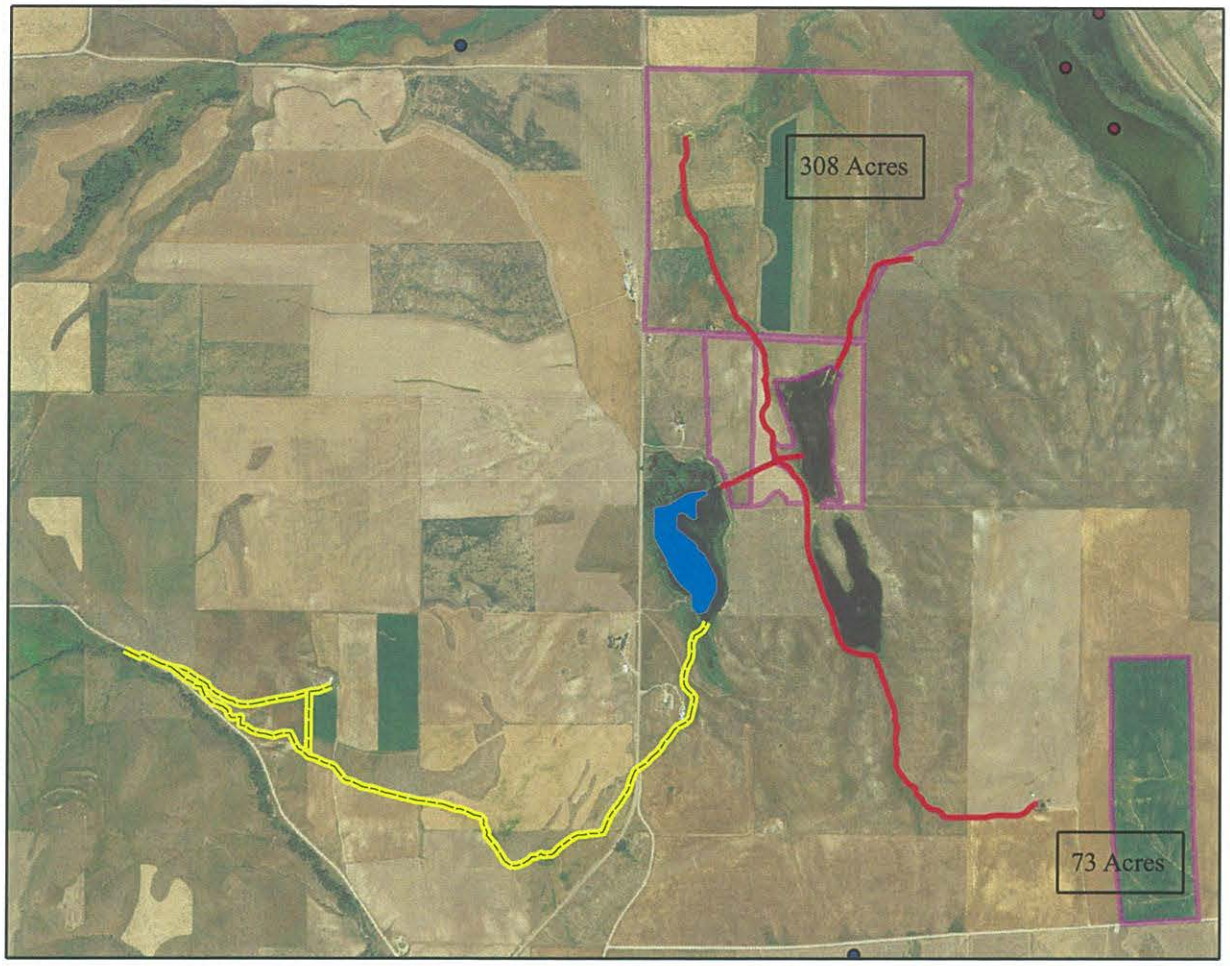
National Wetland Inventory

ATTRIBUTE, WETLAND

- PEM1B, Freshwater Emergent Wetland
- PUBHx, Freshwater Pond
- PEM1F, Freshwater Emergent Wetland
- PEM1C, Freshwater Emergent Wetland



Oxford Reservoir and Irrigation Company
Sensitive Species



Date: 1/22/2014 User: lyla.dettmer

USGS Quadrangle: Oxford, Swan Lake Idaho

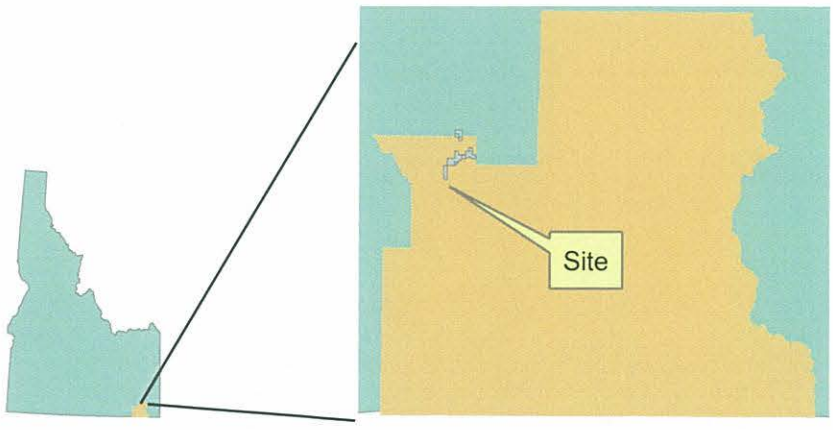
Township 13 South Range 38 East Sections 20, 29

0 750 1,500 3,000 4,500 6,000
Feet

N

Legend

- SharpTailedGrouse_Leks_Aug2013
- Animal_Obervations_2013
- Wolf_Activity_Aug2013
- Plant_Obervations_Aug2013
- Laterals
- Oxford Ditch
- Oxford Reservoir
- Oxford Irr Service Area



U.S. Fish and Wildlife Service

Natural Resources of Concern

This resource list is to be used for planning purposes only — it is not an official species list.

Endangered Species Act species list information for your project is available online and listed below for the following FWS Field Offices:

Idaho Fish and Wildlife Office
1387 SOUTH VINNELL WAY, SUITE 368
BOISE, ID 83709
(208) 378-5243
http://www.fws.gov/idaho/

Project Name:

Oxford

Project Counties:

Franklin, ID

Project Type:

Agriculture

Endangered Species Act Species List (USFWS Endangered Species Program).

There are a total of 4 threatened, endangered, or candidate species on your species list. Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fishes may appear on the species list because a project could cause downstream effects on the species. Critical habitats listed under the **Has Critical Habitat** column may or may not lie within your project area. See the **Critical habitats within your project area** section below for critical habitat that lies within your project area. Please contact the designated FWS office if you have questions.

Species that should be considered in an effects analysis for your project:

Mammals	Status		Has Critical Habitat	Contact

U.S. Fish and Wildlife Service

Natural Resources of Concern

Canada Lynx (*Lynx canadensis*) Population: (Contiguous U.S. DPS)	Threatened	species info	Final designated critical habitat	Idaho Fish And Wildlife Office
North American wolverine (*Gulo gulo luscus*) Population:	Proposed Threatened	species info		Idaho Fish And Wildlife Office
Snails				
Bliss Rapids snail (*Taylorconcha serpenticola*) Population: Entire	Threatened	species info		Idaho Fish And Wildlife Office
Snake River Physa snail (*Physa natricina*) Population: Entire	Endangered	species info		Idaho Fish And Wildlife Office

Critical habitats within your project area:

There are no critical habitats within your project area.

FWS National Wildlife Refuges (USFWS National Wildlife Refuges Program).

There are 1 refuges in your refuge list

Oxford Slough Waterfowl Production Area (208) 237-6615 C/O SOUTHEAST IDAHO NWRC 4425 BURLEY DRIVE., SUITE A CHUBBUCK, ID83202	refuge profile

FWS Migratory Birds (USFWS Migratory Bird Program).

Most species of birds, including eagles and other raptors, are protected under the Migratory Bird Treaty Act (16 U.S.C. 703). Bald eagles and golden eagles receive additional protection under the Bald and Golden Eagle Protection Act (16 U.S.C. 668). The Service's Birds of Conservation Concern (2008) report identifies species, subspecies, and populations of all migratory nongame birds that, without additional

conservation actions, are likely to become listed under the Endangered Species Act as amended (16 U.S.C 1531 et seq.).

Migratory bird information is not available for your project location.

NWI Wetlands (USFWS National Wetlands Inventory).

The U.S. Fish and Wildlife Service is the principal Federal agency that provides information on the extent and status of wetlands in the U.S., via the National Wetlands Inventory Program (NWI). In addition to impacts to wetlands within your immediate project area, wetlands outside of your project area may need to be considered in any evaluation of project impacts, due to the hydrologic nature of wetlands (for example, project activities may affect local hydrology within, and outside of, your immediate project area). It may be helpful to refer to the USFWS National Wetland Inventory website. The designated FWS office can also assist you. Impacts to wetlands and other aquatic habitats from your project may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal Statutes. Project Proponents should discuss the relationship of these requirements to their project with the Regulatory Program of the appropriate U.S. Army Corps of Engineers District.

IPaC is unable to display wetland information at this time.

Table 45 USFWS Region 6 (Mountain-Prairie Region) *BCC 2008* list.[47]

Gunnison Sage-Grouse
Lesser Prairie-Chicken (a)
Horned Grebe
American Bittern
Least Bittern
Bald Eagle (b)
Ferruginous Hawk
Golden Eagle
Peregrine Falcon (b)
Prairie Falcon
Yellow Rail
Black Rail
Snowy Plover (c)
Mountain Plover
Upland Sandpiper
Long-billed Curlew
Hudsonian Godwit (nb)
Marbled Godwit
Buff-breasted Sandpiper (nb)
Short-billed Dowitcher (nb)
Black-billed Cuckoo
Flammulated Owl
Burrowing Owl
Short-eared Owl
Lewis's Woodpecker
Red-headed Woodpecker
Willow Flycatcher (c)
Loggerhead Shrike
Bell's Vireo (c)
Gray Vireo
Pinyon Jay
Bewick's Wren (*bewickii* ssp.)
Sage Thrasher
Sprague's Pipit
Sage Sparrow
Grasshopper Sparrow
Baird's Sparrow
Henslow's Sparrow
Nelson's Sharp-tailed Sparrow
McCown's Longspur
Smith's Longspur
Chestnut-collared Longspur
Black Rosy-Finch
Brown-capped Rosy-Finch
Cassin's Finch

47 (a) ESA candidate, (b) ESA delisted, (c) non-listed subspecies or population of Threatened or Endangered species, (d) MBTA protection uncertain or lacking, (nb) non-breeding in this BCR

ROCKY MOUNTAIN POWER

Idaho - Small Non-Residential

Environmental Impact Calculator

More information is provided by clicking on the question mark icons.

How would you like to support renewable energy?

Choose an option below to calculate your estimated cost and equivalent environmental benefits.

I have a fixed amount to spend.

I have $ [ ] budgeted for renewable energy

Calculate

Complete one option, and then click Calculate.

OR... I want to offset a percentage of the monthly energy use of my business.

How much will offsetting [100] percent cost based on [3500] kwh monthly usage?

Calculate

100% of 3,500 kwh/month is $68.25 available to spend on renewable energy.

This means you can purchase 35 blocks at the Blue Sky price. Over 12 months, your investment means:

kwh renewable energy : 42,000

42,000

Miles not driven : 53,138

0 0 5 3 1 3 8

Cars off the road : 5

CO_2 offset : 52,438 lbs

Number of trees planted : 616

Legend: 1 = 1 mile; = 1 car; = 10,000 lbs; = 100 trees

Oxford Reservoir and Irrigation Company

Hunter Moyles (President)
10280 N Westside Hwy
Clifton ID, 83228

12/14/2013

Dear Bureau of Reclamation,

On behalf of the Oxford Reservoir and Irrigation Company I Hunter Moyles (President), is submitting this official resolution authorized by the board of directors to commit to the financial and legal obligation associated with the receipt of a WaterSMART grant financial assistance, if the application is accepted by the Bureau of Reclamation.

All shared holders have been spoken to and a resolution has been made to pursue this grant application. The Oxford Reservoir and Irrigation Company and its shareholders are ready to take on the in kind contributions specified in the funding plan, and are ready to work with the Bureau to meet all deadlines in the cooperative agreement.

We would like to thank you for your time and effort to make our irrigation system more efficient in water savings and financially possible.

Sincerely,

Hunter Moyles

Oxford Reservoir and Irrigation Company
Hunter Moyles (President)

Water District 13(g)-Oxford

January 18, 2014

Hunter Moyles
Oxford Irrigation
West Side Hwy
Clifton ID 83228

Dear Hunter

We have become aware of your application to pipe the Oxford Ditch. Any improvement to the irrigation systems associated with the water in the Oxford Creek watershed is a good thing.

We will assist in whatever way we can and will provide technical assistance valued at $1.000.00. This will be provided by the watermaster.

Thanks

Walter Hatch
President

Franklin Soil & Water Conservation District
98 East 800 North Suite #5
Preston ID 83263
(208) 852-0562 Ext. 5 email: fswcd@earthlink.net

January 16, 2014

Oxford Irrigation & Reservoir Company
Hunter Moyles
10280 Westside Hwy
Clifton ID 83228

Dear Mr. Moyles,

The Franklin SWCD is in full support of the grant opportunities with the Bureau of Reclamation WaterSMART grant. The function of the conservation district is to take available technical, financial, and educational resources whatever their source, and focus or coordinate them so that they meet the needs of the local landuser for conservation of soil, water, and related resources. We feel that this grant will help us in reaching that goal.

The Franklin Soil & Water Conservation District will provide $5,000 in in-kind match towards the implementation of this grant. In addition we will provide $9,000.00 cash. We will also see that all of our responsibilities and tasks related to this grant are completed in a timely manner.

Sincerely,

Ivan Jensen
District Chairman

æö

I Jay Ransbottom
Committ to providing a cost-
share in the amount of $50,000.
This will be used to install a
hydro turbine and pivot.

Jay Ransbottom
Jan 16, 2014.

United States Department of Agriculture

NRCS
Natural Resources Conservation Service
98 East 800 North, Suite # 3
Preston, Idaho 83263

January 21, 2014

Hunter Moyles, President
Oxford Reservoir and Irrigation Company
10280 N Westside Highway
Clifton, ID 83228

Dear Hunter Moyles,

The Preston Field Office of the Natural Resources Conservation Service (NRCS) supports your proposed project because it furthers the mission of NRCS in Franklin County. The mission of the NRCS is to provide leadership in a partnership effort to help people conserve, maintain and improve our natural resources and environment. This is done primarily on private lands. This project would address two resource concerns identified as high priorities for Franklin County by NRCS and the Franklin Soil and Water Conservation District (SWCD): 1) water quantity - inefficient use on irrigated lands and 2) water quality - suspended sediment and turbidity. Your proposed project would reduce inefficient use of irrigation water by reducing seepage losses in earthen ditches/canals. The project would also eliminate sediment losses occurring currently on the canal delivering water to Oxford Reservoir.

Your proposed project would generate energy from a renewable source which would reduce America's dependence on foreign oil. This will allow a landowner to make his agriculture operation more sustainable.

Sincerely,

Boyd A. Bradford
District Conservationist