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December 2017

Owl Creek Watershed, Level I Study

EXECUTIVE SUMMARY



PREPARED FOR:
WYOMING WATER
DEVELOPMENT
COMMISSION



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Owl Creek Level I Watershed Study

Executive Summary
December 2017

Prepared for:

Wyoming Water Development Commission

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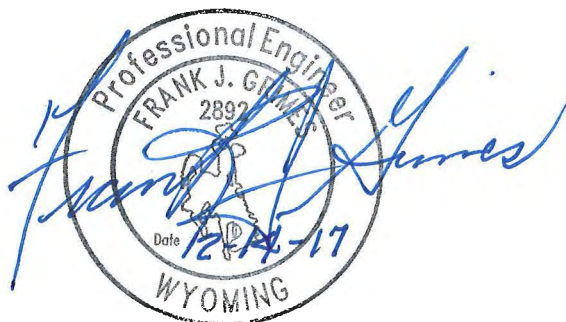
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1.0 Introduction

In 2015, the Hot Springs Conservation District (HSCD) requested funding from the Wyoming Water Development Commission (WWDC) for completion of a watershed study and management plan for the Owl Creek Watershed. The intent of the study was to evaluate current watershed hydrology, water availability, water supply, and water storage systems in the Owl Creek and neighboring Coal Draw and Sand Draw Watersheds. The WWDC selected Lowham Walsh Engineering and Environmental Services, LLC (LW) to complete this study.

Previous WWDC studies have been completed in the watershed. These include a Level I Master Plan Study conducted in 2004, Level I and II Rural Water Supply studies conducted in 2007 and 2009, and a Level II Owl Creek Irrigation District Conservation Study conducted in 2006. These studies were reviewed as part of this watershed study.

2.0 Background

The HSCD is interested in enhancing natural watershed processes and repairing or developing water supplies, irrigation conveyance systems, and upland livestock and wildlife water sources. HSCD is seeking information that enables a better understanding of natural resources within the Study area. They require a plan that outlines potential management strategies based on a full evaluation of water development opportunities, specifically focusing on approaches that enhance watershed function.

The Owl Creek Watershed Study area is located in north-central Wyoming within the Upper Bighorn River Basin Watershed on the eastern slope of the Continental Divide. The Owl Creek Study area drains a 937-square mile area within the Wind/Bighorn River Basin (**Figure 1**). The watershed is bounded to the south by the Owl Creek Mountains, to the west by the Absaroka Mountains, and to the north by a low plateau that separates Owl Creek from Cottonwood Creek. The Study area also includes land within Coal Draw and Sand Draw, irrigated lands along the Bighorn River adjacent to the area of Lucerne, and those drainages flowing into the Bighorn River as far south as the crest of the Owl Creek Mountains. Approximately 25,000 acres of land are irrigated within the Study area. The Owl Creek Watershed Study and Management Plan, Level I focuses on potential improvements to, and water conservation on, lands within this Study area.

Much of the land within the Owl Creek Basin lies within the Wind River Indian Reservation (WRIR). With completion of the Wyoming Big Horn General Stream Adjudication in September 2014 (Case Number S-15-0008. See Robison 2015), certain reservation lands were awarded an 1868-reserved water right. Other non-Indian owned lands that were once part of the WRIR observe a similar award. These lands have what are known as “Walton Rights” and also have a priority date of 1868. According to the 2016 hydrographer’s usage report, roughly 20 percent of these water rights, or approximately 3,853 ac-ft. (ac-ft.) of water, was not utilized by those who own Tribal or Walton rights. The un-utilized portion of these rights was available to downstream users. If all Tribal water rights were utilized, it is likely that in all but the wettest year, downstream users would have significantly less water for irrigation. The General Adjudication has created a more precarious water supply situation for territorial and state water rights holders (Nelson 2004).

One of the purposes of this Level I watershed study is to provide a basis for the WWDC to make future decisions pertaining to State funding of water development projects. Upon completion of the Level I watershed study, landowners and stakeholders within the geographic boundaries of the project Study area become eligible to apply for funding through the WWDC’s Small Water Project Program, or SWPP. Small Water Projects are defined as projects where estimated costs for construction, permit procurement,

construction engineering and project land procurement are \$135,000 or less. Applicants can receive a grant from WWDC for up to 50% of project costs with a \$35,000 maximum contribution.

For SWPP projects, individuals apply for funding through the HSCD, which serves as the applicant's sponsor. Application deadlines are December 31st of the year for consideration. According to the WWDC's operating guidelines, project priorities are as follows:

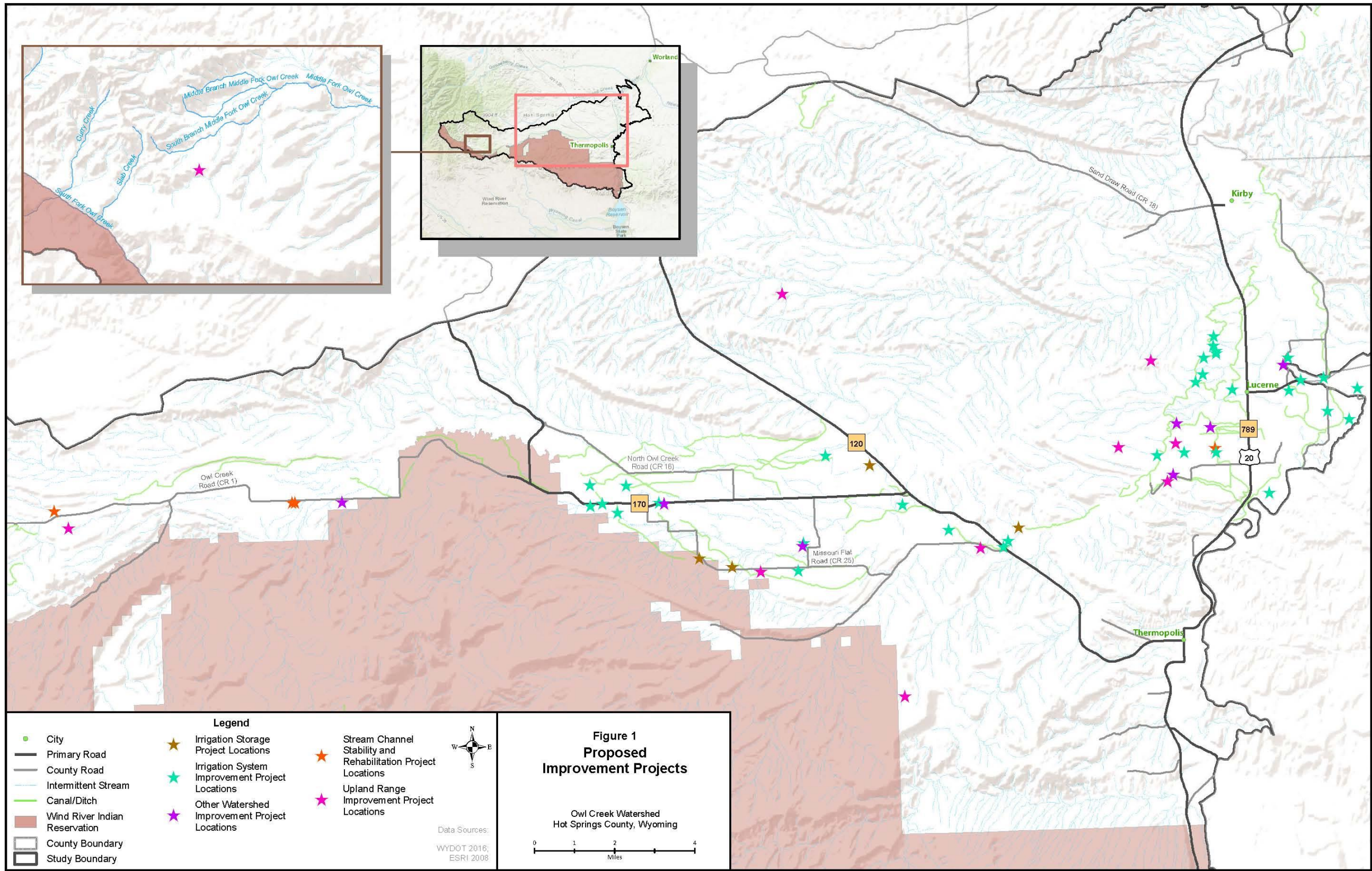
1. Source water development
2. Storage
3. Pipelines, conveyance facilities, solar platforms and windmills
4. Irrigation
5. Environmental habitat improvement

SWPP projects that are "shovel-ready" – those that have completed all necessary permitting, have certified designs, procured all agency notifications, have access to necessary land, and finalized other financial agreements – will be considered as a funding priority at the discretion of the WWDC. These projects should be identified and submitted for funding as soon as possible so that the benefits of these projects can be observed. This will likely increase interest and awareness of the benefits associated with the watershed planning process.

Projects with estimated costs over \$135,000 may be eligible for "conventional project" funding through WWDC. For these project types, landowners should consider district formation (and application to the WWDC for Level II or Level III evaluation and project funding. Grant levels vary depending on project level. Project criteria and cost share information is available on the WWDC webpage.

The Study report provides a project description, map, and cost estimate for each project, presented at a conceptual level. Projects that are selected for sponsorship by the HSCD may need further design and cost estimations prior to projects being implemented to account for overlooked and unlisted items, revisions in extent and layout of the final project, subsurface conditions, inflationary increases since inception, changed conditions, and other costs.

The Study report describes funding opportunities through the WWDC, as well as other state, federal, and private entities. It also provides information about potential permits required, and presents information about the ecological benefits that each project may bring, if constructed and operational.



U:\Projects_2019\OwlCreekWatershed\Mapi\Mxd\Report\Fig_1_ProposedProjects.mxd 12/4/2017

3.0 Project Purpose and Goals

According to the WWDC’s Small Water Project Program (SWPP) Operating Criteria, the Watershed Study program’s purpose is to provide landowners and agencies incentives to improve watershed condition and function. Projects should improve watershed condition and function and provide benefit for wildlife, livestock and the environment. Projects may provide improved water quality, fish and wildlife habitat, by providing water supplies to support plant and animal species or serve to improve natural resource conditions.

The primary goal of this Level I Study is to combine existing, published data with data collected and generated from this Study to form a comprehensive Watershed Management and Rehabilitation Plan.

Secondary goals and objectives include:

1. Gather and summarize relevant data on the physical, biological, geomorphologic, hydrologic, and ecologic conditions in the watershed and describe the connections that exist between watershed conditions and opportunities for water resource development.
2. Engage the public in the planning process by providing information about the Study and soliciting local knowledge about and the interest in updated management practices and project improvements.
3. Provide a qualitative and quantitative overview of benefits resulting from the implementation of projects identified in the watershed and rehabilitation plan.
4. Identify the needs and opportunities to improve land and water management practices for irrigation, water distribution and storage, water quality, and ecosystem health.
5. Prepare concept designs and cost estimates for practical, economical improvement projects. Provide a framework to prioritize projects.
6. Provide an overview of permits and regulatory frameworks that may affect the implementation of projects.
7. Provide information on potential funding sources.

4.0 Watershed Management Plan

Eighty-nine projects were identified and are included in this report. In order to track individual projects proposed in the Watershed Management Plan, each project was designated with a unique prefix and number. The prefix describes the category of watershed management the project falls within. The number tracks each project separately. In general, for each category, numbers increase from upstream to downstream. **Table 1** lists the various project identified during the watershed study by type and number. A list of projects by project type is included in **Table 2**. A brief descriptive summary follows.

<i>Table 1 Project Categories</i>	<i>Project Type</i>	<i># of Projects Inventoried</i>
Irrigation System Improvements	ISYS	52
Irrigation Storage Projects	ISTO	4
Stream Channel Stability and Rehabilitation Projects	SCS	6
Upland Range Improvements	URI	14
Other Watershed Improvements	OWI	10
Projects Recommended for Level II Study	Level II	3
TOTALS		89

Table 2: Project Summary Tables for All Projects Identified During the Study

Project Number	Ditch/Stream	Location	No. of Users	Estimated Acreage Served (Acre)	Pipeline Length, Size, & Material	New Center Pivot	New Gated Pipe	Brief Description
ISYS-001	Woodard	S34, T9N, R3E	2	30	4000' 10" PVC (PIP) SDR-41			Install buried pipeline, measuring devise, FTO, air vent
ISYS-002	Chessington-Wilson	S3, T8N, R3E	3	35	110' 10" PVC (PIP) SDR-41 520' 10" PVC Surface Pipe		X	Install new buried pipeline and new gated pipe. Update check structure
ISYS-003	Chessington-Wilson	S3, T8N, R3E	3	65	2080' 12" PVC (PIP) SDR-41			Install new buried pipeline and upgrade splitter box. Install flow measurement risers for midstream user
ISYS-004	Woodard-Johnson	S3, T8N, R3E	4	315	2300' 21" PVC (PIP) SDR-41			Install buried pipeline and reroute flow under adjacent field
ISYS-005	Winchester	S35, T9N, R3E	6	350	9500' 24" PVC (PIP) SDR-41			Convert a portion of the Winchester Ditch to buried pipeline, include sand trap, rip-rap
ISYS-006	Merrill	S11, T43N, R97W	1	50	600' 24" PVC (PIP) SDR-41			Install buried pipeline
ISYS-007	South Side	S16, T8N, R4E	1	70	1200' 10" PVC Surface Pipe		X	Permit wells for stock and irrigation use. Install windmill and construct stock reservoir. New gated pipe. 3 Existing Wells for permitting, 1 new well to be drilled
ISYS-008	Ready	S9, T8N, R4E	1	6	N/A			Install new FTO with measuring device and Pod sprinkler system
ISYS-009/009A	Martin	S13, T43N, R96W S19, T43N, R95W	3	520	795' 21" PVC (PIP) SDR-41 1080' 10" PVC (PIP) SDR-41			Convert a portion of the Martin Ditch to buried pipeline
ISYS-010	Thompson	S9, T43N, R96W	1	60	4000' 10" PVC (PIP) SDR-41			Reconstruct a portion of the Thompson ditch and install buried pipeline
ISYS-011	Hale	S14, T43N, R96W	1	35	1700' 12" PVC (PIP) SDR-41 4870' 10" PVC Surface Pipe		X	Install new buried pipeline, measuring device and new gated pipe
ISYS-012	Martin	S19, T43N, R95W	1	30	650' 10" PVC (PIP) SDR-41	X		Install half center pivot, measuring device and buried supply line
ISYS-013	Martin	S19, T43N, R95W	1	38	270' 12" PVC (PIP) SDR-41 1200' 10" PVC Surface Pipe		X	Install new buried pipeline and new gated pipe
ISYS-014	Upper Lucerne	S11, T43N, R95W	1	5	500' 6" LLDPE Surface Pipe			Install drainage system and solar sump pump
ISYS-015	Upper Lucerne	S2, T43N, R95W	1	110	5330' 15" PVC (PIP) SDR-41			Install buried pipeline
ISYS-016/016A	Upper Lucerne	S36, T44N, R95W	2	35	1400' 10" PVC (PIP) SDR-41			Install buried pipeline, measuring device, check structure and splitter box
ISYS-017-023	Upper Lucerne Lower Lucerne	S36, T44N, R95W S30, T44N, R94W	3	495	N/A			Install/replace 7 flow measurement devices. 6 metal long throated flumes and 1 in-stream flow device
ISYS-024	Lucerne	S7, T43N, R94W	N/A	N/A	180' 42" HDPE			Rehab of Lucerne Canal siphon under Owl Creek including tube, approach and discharge aprons and walls, air vents and rip-rap
ISYS-025	Cyclone	S17, T43N, R94W	5	200	2600' 15" PVC (PIP) SDR-41			Install buried pipeline to supply 5 landowners and install 5 new FTO
ISYS-026	Kirby Canal	S28, T44N, R94W	1	10	800' 8" Surface Pipe		X	Install new gated pipe
ISYS-027	Kirby Canal	S33, T44N, R94W	1	100	1200' 10" PVC (PIP) SDR-41 3500' 10" PVC (PIP) SDR-41	X		Install half center pivot and buried supply line with measuring device
ISYS-028	Kirby Canal	S33, T44N, R94W	1	30	1000' 10" PVC Surface Pipe			Install buried pipeline and gated pipe
ISYS-029-30	Kirby Canal	S4, T43N, R94W	1	110	1800' 10" PVC (PIP) SDR-41 1000' 10" PVC Surface Pipe	X	X	Install half center pivot and buried supply line. Install new gated pipe, 2 new FTO with measuring device's
ISYS-031	Kirby Canal	S34, T44N, R94W	1	20	1850' 10" PVC (PIP) SDR-41 900' 10" PVC Surface Pipe		X	Install new buried pipeline with measuring device, and new gated pipe
ISYS-032	Kirby Canal	S33, T44N, R94W	3	166	1680' 10" PVC (PIP) SDR-41 1250' 10" PVC Surface Pipe		X	Install new buried pipeline with measuring device, new FTO, and new gated pipe

*All values were estimated either during time of field visit or after desk top analysis. All values should be confirmed prior to processing of the project.

Project Number	Ditch/Stream	Location	No. of Users	Estimated Acreage Served (Acre)	Pipeline Length, Size, & Material	New Center Pivot	New Gated Pipe	Brief Description
ISYS-W01	Big Horn	S13, T42N, R95W	1	15	15 HP motor and high efficiency centrifugal pump			Replace existing pump and motor and install 4 inch HDPE SDR 11 laterals to sprinkler heads.
ISYS-W02	Upper Lucerne	S12, T43N, R95W	1	2	450' 10" PVC (PIP) SDR-41			Installing buried pipe in county road right-of-way, through existing culvert under the road.
ISYS-W03	Upper Lucerne	S12, T43N, R95W	12	100	Unknown			Replace approximately 2,400' of degraded concrete lining of an open channel ditch
ISYS-W04	Lower Lucerne	S7, T43N, R94W	3	20	320' 12" PVC (PIP) SDR-41			Install new buried pipeline with measuring device
ISYS-W05	Owl Creek	S6, T43N, R94W	1	NA	7,760' of perforated drainage system. Size to be determined			Install perforated drainage system
ISYS-W06	Lucerne Canal	S7, T43N, R94W	1	40	25 HP variable flow pump			Replace 2 existing pumps with one larger more efficient pump
ISYS-W07	South Side	S15, T80N, 40E	2	80	1600' Buried pipe, 4 headgate structures, and 2,700' of gated pipe		X	Change POD for one landowner and replace 3 existing degraded headgates. Install gated pipe for both users
ISYS-W08	Owl Creek	S11, T43N, R97W	1	15	400' Buried pipe, 1600' gated pipe		X	Install new POD and pump system to feed proposed gated pipe
ISYS-W09	Upper Lucerne Canal	S30, T44, R94W	2	NA	1500' 12" PVC (PIP) SDR-41			Install new buried pipeline with measuring device and new FTO
ISYS-W10	Lucerne Canal	S29, T44N, R94W	1	30	Siphon size and specifications to be determined			Install siphon under drainage channel
ISYS-W11	Lower Lucerne Canal	S31, T44N, R94W	4 or 5	100	4,800' 12" PVC(PIP) SDR-41			Install buried pipeline, new FTO risers with measuring devices for each user
ISYS-W12	Red Creek	S34, T90N, R20E	2	50	1,670' 16" PVC (PIP) SDR-41			Install two separate lengths of buried pipe, starting at diversion off of Red Creek
ISYS-W13	Big Horn	S06, T44N, R94W	1	163	1,100' 15" PVC (PIP) SDR-41			Install 1,100 feet of buried pipe to supply pivot
ISYS-W14	South Side	S12, T43N, R95W	5	45	4,200' UNK" PVC (PIP) SDR-41			Install buried pipeline to supply 5-6 landowner with irrigation water
ISYS-W15&16	McManus	S17, T43N, R95W	2	228	24" headgate			Rehabilitate 24" headgate
ISYS-W17	McManus	S17, T43N, R95W S16, T43N, R95W	1	85	Unknown			Rehabilitate or replace 6 different FTO
ISYS-W18	Hale #2	S18, T43N, R95W	1	?	Unknown			Rehabilitate or replace the 24" headgate on Hale #2 ditch
ISYS-W19	Owl Creek	S13, T43N, R96W	1	10	1,200' PVC (PIP)			Install buried pipe to feed existing open ditch
ISYS-W20	Owl Creek	S10, T80N, R40E	1	100	5000' of 18-24" PVC (PIP) SDR-41			Install 5000' of buried pipe for irrigation

*All values were estimated either during time of field visit or after desk top analysis. All values should be confirmed prior to processing of the project.

Project Number	Ditch/Stream	Location	Primary Uses	Earthwork (units as indicated)	Miscellaneous Construction	Piping(LF)	Brief Description
Owi-001	Red Creek, Natural Runoff	S3, T8N, R2E	Stock, Recreation, Flood Control	25 Cysds Bentonite		50' -6" diameter DR-32 PVC Discharge Pipe with valve	Rehabilitation of existing reservoir. Install Bentonite lining and outlet infrastructure.
Owi-002	Merrill Ditch	S11, T43N, R97W	Irrigation, Stock, Tlapija Farming, Recreation, Wildlife	25,500 Cysds exc. to embankment	Low head irrigation pump		Construct new reservoir. May require re-pumping some water for irrigation.
Owi-003	N/A	S9, T8N, R4E	Stock, Recreation, Wildlife	40 Ton Gravel, 50 Cysds excavation	25 Infiltrators		Construct new septic system to replace non-functioning evaporative septic pond. Rehabilitate septic pond into stock reservoir.
Owi-004	Irrigation runoff	S12, T43N, R95W	Stock, Recreation, Wildlife			50' -6" diameter DR-32 PVC Discharge Pipe	Develop an existing gravel pit into a reservoir. Install outlet structure.
Owi-005	Upper Lucerne Canal	S1, T43N, R95W	Stock, Recreation, Wildlife, Flood Control	4,100 Cysds. Embankment, 825 Cysds Excavation		150 Ton 12" L.D. Rip-Discharge Pipe w/Valve	Rehabilitate existing reservoir embankment. Install outlet structure.
Owi-006	Irrigation runoff	S6, T43N, R94W	Stock, Recreation, Wildlife	25,500 Cysds exc. to embankment		50' -6" diameter DR-32 PVC Discharge Pipe w/Valve	Construct new reservoir.
Owi-007	N/A	S32, T44N, R94W	Flood Control	950 Cysds. Embankment, 250 Cysds Excavation	310 Ton 12" L.D. Rip-Rap		Construct berm to prevent residential flooding at the confluence of Kirby Creek and the Big Horn River.
Owi-W01	N/A	S32, T44N, R94W	Flood Control				Capture excess water to control flooding and minimize erosion.
Owi-W02	UNK	S14, T43N, R96W	Livestock and Irrigation				Install buried pipe in two locations to feed livestock tank and irrigation ditch.
Owi-W03	N/A	S5, T44N, R94W	Irrigation				Conduct land leveling to install center pivot.

*All values were estimated either during time of field visit or after desk top analysis. All values should be confirmed prior to processing of the project.

Project Number	Land Ownership	Location	Estimated AUM Served	Δ Elevation (ft)	2" HDPE Pipeline Length (ft)	Energy Source	New Stock Tank	Brief Description
URI-001	Private	S19, T43N, R101W	200	240	3550' DR-41 HDPE Buried Pipe	Solar	X	Install DR-41 buried pipeline and solar powered pump from developed spring to new stock tank, install buried gravity pipeline from stock tank to existing pipeline
URI-002	Private	S8, T43N, R99W	200	257	2900' DR-41 HDPE Buried Pipe	Commercial	X	Install buried pipeline and new pump from existing well up to new stock tank. Existing well requires rehabilitation and testing
URI-003	State, BLM	S16, T44N, R96W	300	160	4600' DR-41 HDPE Buried Pipe	Solar	X	Install buried pipeline and solar powered pump from existing well up to new stock tank
URI-004	Private	S8, T8N, R4E	40	N/A	N/A ??? What does this mean, no buried or surface pipe	Solar	X	Drill new well, install solar powered pump, and buried pipeline to new stock tank
URI-005	Private, BLM	S19, T43N, R95W	81	120	1800' DR-41 HDPE Buried Pipe	Solar	X	Install buried pipeline and solar powered pump from existing well up to new stock tank
URI-006	Private	S2, T42N, R96W	100	600	4700' DR-41 HDPE Buried Pipe	Solar	X	Install buried pipeline and solar powered pump from existing well up to proposed stock tank and existing reservoir; may require a solar powered relief pump due to elevation requirement
URI-007	Private	S12, T43N, R95W	N/A	N/A	N/A	N/A		Rehabilitate existing stock reservoir which is washing out. Install outlet structure.
URI-008	Private, State, BLM	S3, T43N, R95W	N/A	N/A	10,000' DR-41 HDPE Buried Pipe	Solar	X(3)	Drill new well, install solar powered pump, and buried pipeline to multiple new stock tanks*
URI-008A	Private	S26, T44N, R95W	230	230	8150' DR-41 HDPE Buried Pipe	Commercial	X(3)	Install buried pipeline and pump from oil field discharge pond up to new stock tanks*
URI-009	Private	S2, T43N, R95W	24	24	1200' DR-41 HDPE Buried Pipe	N/A	X	Install a buried pipeline from an existing stock reservoir to proposed geothermal watering devices for livestock
URI-W01	Private	S10, T43N, R100W			7,000' HDPE 2" Buried Pipe	Solar		Install buried pipeline and solar powered pump from spring to three existing stock tanks
URI-W02	Private	S7, T43N, R99W	188	Unknown	Unknown	Solar	X	Rehabilitate three existing wells, install solar powered pumps and stock tanks for livestock and wildlife
URI-W03	Private	S7, T43N, R99W	188	Unknown	Unknown	Solar		Develop an existing spring, install solar powered pump for livestock and wildlife
URI-W04	Private	S7, T43N, R99W	188	Unknown	Unknown	Solar		Develop an existing spring and install solar powered pump to distribute livestock watering locations
URI-W05	Private	S7, T43N, R99W	188	Unknown	Unknown	UNK	X	Install buried pipeline from well referenced in URI-W02 to proposed livestock tank

*Project is broken into two independent alternatives. Only one is to be completed.

*All values were estimated either during time of field visit or after desk top analysis. All values should be confirmed prior to processing of the project.

Project Number	Stream	Location	Earth Work Required (CY)	Channel Structures	Miscellaneous Construction	Miscellaneous Structures	Brief Description
SCS-001	N Fork Owl Creek	S8, T43N, R99W	110	Stabilization	Bank Reinforcement		Repair erosion resulting in down cutting
SCS-002	Red Creek	S4, T8N, R2E	33	check structure	New concrete CMP, new	New Sand Trap	Diversion in disrepair. Requires replacement to prevent down cutting
SCS-003	Red Creek	S4, T8N, R2E	75		60'-24" dia. CMP, 25 ton 12" L.D. Rip-Rap		Repair erosion threatening to compromise irrigation ditch parallel to Red Creek
SCS-004	Owl Creek	S7, T43N, R94W	40	check structure	New concrete New FTO, 15 Ton	New Sand Trap	Diversion in disrepair. Requires replacement to prevent down cutting
SCS-W01	N Fork Owl Creek	S13, T43N, R100W	Unknown	Unknown	Unknown	Unknown	Rehabilitation of irrigation diversion
SCS-W02	Red Creek	S34, T90N, R20E	Unknown	Unknown	Unknown	Unknown	Repair erosion on Red Creek with new diversion structure

*All values were estimated either during time of field visit or after desk top analysis. All values should be confirmed prior to processing of the project.

Project Number	Ditch/Stream	Location	Estimated Capacity (Acre-Ft)	Served (Acre)	Brief Description
ISTO-001	Woodard Johnson/Natural Runoff	S7, T8N, R4E	40	135+/-	Rehabilitate existing reservoir and repair wash out upstream of reservoir; repair low level outlet
ISTO-002	Natural Runoff	S8, T8N, R4E	>20	30+/-	Construct new reservoir with low level outlet. The reservoir would serve as flood control and irrigation use
ISTO-003	Natural Runoff	S10, T43N, R96W	6	10+/-	Drill new well, install solar array and pump, and rehabilitate existing reservoir
ISTO-004	Proposed Diversion off of Owl Creek	S17, T43N, R95W	50	60+/-	Convert an existing gravel pit into a reservoir; include lining as necessary. Install outlet works and pumping station for irrigation.

*All values were estimated either during time of field visit or after desk top analysis. All values shall be confirmed prior to advancing the project.

Table 2, cont'd

4.1 Irrigation System Improvements (ISYS):

Fifty-two ISYS projects were identified and incorporated into the watershed management plan. Proposed improvements identified include installation of measurement devices on ditches where those devices no longer function or are lacking, construction of new diversions structures, headgates, and field turn-outs, and upgrading earthen ditches to buried pipelines.

4.2 Irrigation Storage Projects (ISTO)

Irrigation storage projects focused on small, on-farm projects of between six and 50 acre feet capacity. Projects include rehabilitating existing reservoirs for stock water and irrigation use with one incorporating a new well with solar powered pump, constructing a new reservoir to serve as flood control and an irrigation source, and converting an existing gravel pit to an irrigation reservoir.

It is important to note that SWPP funding will only cover reservoirs with a capacity of 20 acre-feet or less. No proposals were submitted for large reservoirs that would serve multiple users during the course of the Study. There are a few existing reservoirs that provide water for irrigation use; these are discussed in Section 3.9 of the Study report.

4.3 Stream Channel Stabilization Projects (SCS)

Six SCS projects were identified and described. Four projects were proposed to repair diversions, using rock or concrete, that have been affected by downcutting. Two of these projects are proposed to upgrade existing diversions that are currently constructed with a variety of materials (traffic signs, railroad ties, etc.) and are unstable and hazardous to the ditch owner. These home-made structures also threaten the long-term stability of the stream channel, should they fail. Two projects are proposed to address stream migration that has limited the effectiveness of existing diversion and headgate structures. Two projects are proposed to protect ditches from the encroachment of the drainage itself.

Permitting through the USACE and WDEQ-Water Quality Division may be required for these projects. However, “rehabilitation” projects may be exempt from permit requirements at USACE.

The Game and Fish encourages all diversion structures be constructed to allow fish passage to maintain and improve fish habitat.

4.4 Upland Range Improvements (URI)

Fourteen Upland Range Improvement projects were identified. Twelve projects address spring development or improvement. Ten of these include installation of solar pumps, while two would use commercial power. Eleven projects include the use of buried pipe to move water to new stock tanks or reservoirs. Three reservoir improvements are included.

These projects require the landowner to have valid water rights for the improvement.

In addition to proposed projects, the Study found that there are portions of grazing land within the Study area that are more than two miles from water – the distance a cow will generally walk to get water. Most of these areas are not limited by steep topography. Rocky areas without significant forage were reviewed and found to be too small to be mapped. Livestock and wildlife water sources are discussed in Section 3.1.6 and 3.9.3 of the report.

4.5 Other Watershed Improvements (OWI)

Ten watershed improvements were identified that did not strictly fit into other project categories. Six of these projects are reservoir development projects, one is a septic system project and pond overhaul, one is a land leveling project, and one project is designed to control flooding and minimize erosion.

Permits likely required may include the USACE, WDEQ Water Quality Division, and Wyoming State Engineer for water rights acquisition.

4.6 Projects Recommended for Level II Study

Lucerne Level II Project: The LW team completed a field visit with representatives of OCID and the Lucerne Pumping Plant and Canal Company (LPPC) to assess infrastructure concerns within the Lucerne area, which encompasses the Upper, Lower, and Dempsey Canal systems. The LW team recommends that Lucerne Area projects be grouped into one OCID-sponsored project. It is recommended that an application be submitted to WWDC for a Level II study. The scope and extent of the study should include revisiting seepage issues, updating the LPPC infrastructure inventory, addressing installation of safety features; developing detailed plans to rehabilitate all major infrastructure within the system including the diversion, pump station, siphons, culverts, re-lift station, and sections of the canals. Appropriate construction and project cost estimates would also be required.

Cyclone Ditch Level II Project: The LW team was approached during a workshop meeting by a representative user of the Cyclone Ditch system. The user indicated that it would be necessary to review failing infrastructure through the entire system, which is independent of other irrigation districts and canal companies in the area. Some of the issues identified were failing infrastructure, lack of flow measurement, seepage loss in sandy soil, and other delivery inefficiencies. In order to proceed, the ditch company would need to become a public entity to be eligible to sponsor a Level II project.

Large Headcuts on BLM Land Level II Project: The LW team observed three large headcuts located to the northwest of Thermopolis land located on two BLM allotments south of Missouri Flats road. One headcut has a spring emanating from it that the lessee would like to develop as a livestock water source. Two of the headcuts were located adjacent to silted-in reservoirs that may have contributed to the development of the headcuts.

5.0 Benefits of Watershed Planning

The Level I Watershed Study sponsored by the WWDC provides a landscape level analysis of a hydrologically connected watershed and nearby, associated, smaller watersheds that are within Hot Springs County. It focuses on two primary components.

The first is identification of the physical attributes of the analysis area. The second is a long range plan outlining management and/or rehabilitation opportunities and activities that address irrigation efficiency, watershed function, and ecological enhancement. Ecosystem functions and landscape health benefit from watershed management strategies that improve soil health, water infiltration / percolation, and other water cycle elements.

Expected project benefits can be related to watershed function including collection and storage of water along with ecological enhancements such as plant and animal habitat and stream corridor or riverine

stability as well as societal values including economic stability and open space maintenance. Section 5 of the Study report describes benefits in more detail.

6.0 Cost Estimates

Cost estimates are provided for each project in the Study report in Section 6. Costs were developed based on conceptual designs and NRCS Practice Standards/Codes. Published costs were modified to 1) produce estimates in compliance with the WDO contractual requirements, and 2) develop project costs representative of the work required, based on in-house experience. All costs estimates are conceptual in nature and generally will require more detailed analysis prior to implementation. A summary of costs for different project types is in **Table 3**.

<i>Table 3</i> Project Categories	Project Type	# of Projects Inventoried	Total Estimated Value of Projects
Irrigation System Improvements	ISYS	52	\$3,534,000
Irrigation Storage Projects	ISTO	4	\$235,000
Stream Channel Stability and Rehabilitation Projects	SCS	6	\$199,000
Upland Range Improvements	URI	14	\$348,000
Other Watershed Improvements	OWI	10	\$261,000
Other Recommended Watershed Improvements	Level II	3	Not estimated
Totals		89	\$4,577,000

7.0 Project Evaluation Criteria, Funding Opportunities, and Permit Requirements

Section 7 of the report describes criteria that could be used to help determine which projects should be supported by the HSCD. Eleven criteria were developed, in addition to the five criteria listed by WWDC.

Section 8 of the Study report provides information on funding available through different federal and state agencies and organizations. Many of these programs provide technical and/or financial assistance to agricultural producers, private landowners, various land management agencies, and other organizations for implementation of activities that benefit future watershed improvements.

Section 9 of the Study report discusses the permitting obligations that must be satisfied before the project can be implemented. This section of the report provides an outline of the anticipated permitting processes, including a summary of the necessary permits, requirements for environmental analysis and documentation, resource agency coordination, and estimated timelines.

8.0 Conclusions and Recommendations

The Study documented several conditions that affect the availability and distribution of water including: irrigation systems that are inefficient due to seepage or siltation, diversion structures and flow measuring devices in poor or non-working condition, stock and irrigation reservoirs that no longer hold water, and areas of upland rangeland that support palatable forage but are far from reliable water sources. There is significant opportunity for improved water storage, distribution, and use within the Study area.

After reviewing all of the collected data, it is highly recommended that the following types of improvements be completed in order to maximize efficient use of water resources and protect watershed condition and function within the project area.

1. Replace failing or inadequate infrastructure
2. Replace poor or non-existent measurement capabilities
3. Eliminate excessively long open channel ditch laterals serving limited acreage.

The recommended improvements summarized here and discussed in Section 4.4 of the Study report can be developed individually or in combination with other projects proposed by the same or nearby landowners. Bulk purchase of materials between landowners may result in a cost savings. Funding assistance is likely available for most of the projects identified through the WWDC Small Water Project Program. Additional funding may be available through WWDC Conventional program, or other state and federal agencies such as Wyoming Game and Fish Department, WDEQ Water Quality Division (WQD) (for project improving stream water quality) and the Natural Resources Conservation Service (NRCS).

Funding opportunities may also exist with private groups for construction of in-stream structures, diversions, or spring and stock pond development through groups such as Trout Unlimited, Water for Wildlife, and the Wyoming Wildlife and Natural Resource Trust.

The NRCS has multiple programs, including the Regional Conservation Partnership Program (RCPP). As well, the WQD has money available – though funding is limited as of 2017 – through the “319” program as part of the Clean Water Act. These funds can be used independently or together with WWDC funding for achieving resource management goals such as improving water quality, wildlife habitat, and stream restoration.

By combining funding sources, the owner could conceivably obtain grants for most, if not all, of the project costs. Information about funding options is included in Section 8 of the Study report.

Many projects would require involvement or permitting through regulatory agencies such as the U.S. Army Corps of Engineers (USACE). Work completed within stream channels would require coordination with USACE. Rehabilitation activities may be exempted from “Section 404” (of the Clean Water Act) permitting due to USACE’s exclusion for irrigation system maintenance efforts. New facilities would likely need a Section 404 permit.

Every effort was made to provide information within this document to support the application for SWPP funding from the WWDC with HSCD sponsorship. Project narratives, conceptual designs, cost estimates, and discussion of project benefits can all be incorporated into the SWPP application by the HSCD.

The public outreach portion of this project attempted to accommodate all interested parties. To the best of the project team’s knowledge, all who expressed interest in participating were contacted. However, experience has shown that additional “new” individuals will come forward wishing to participate after this Level I study is completed. These individuals are eligible to apply for SWPP funding if their property is within the geographic boundaries of the Study area. They simply have not had the benefit of having met with the project team and having a portion of their application needs provided to them. They are subject to the same application requirements and deadlines as those who did participate.