MELODY RANCH ISD
LEVEL I STUDY

EXECUTIVE SUMMARY

September 1, 2017

PREPARED FOR:

WYOMING WATER DEVELOPMENT COMMISSION

PREPARED BY:

NELSON ENGINEERING since 1964
Professional Engineers & Land Surveyors
• JACKSON, WY • BUFFALO, WY •

PO Box 1599
Jackson, Wyoming 83001
307-733-2087
www.nelsonengineering.net

Lidstone and Associates, Inc.
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4025 Automation Way, Bldg E
Fort Collins, Colorado 80525
970-223-4705
www.lidstone.com

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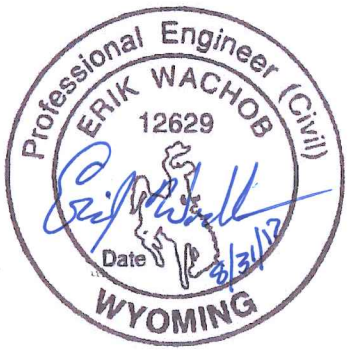
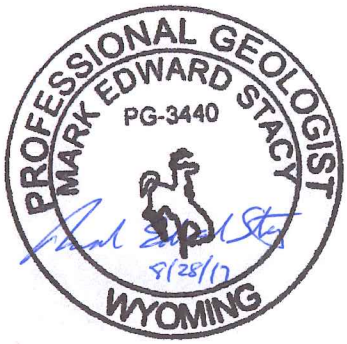


Erik Wachob, PE
Wyoming PE 12629



Mark Stacy, PG
Wyoming PG 3440

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1 Introduction

Melody Ranch Improvement and Service District (MRISD) is located in unincorporated Teton County. It covers approximately 210 acres, and consists of the 366 residential lots within the Melody Ranch subdivision, along with the Melody Ranch Townhomes, Sage Meadows, and Glory View subdivisions. Melody Ranch subdivision was platted between 1995 and 2008. MRISD was formed in 2012 and took over responsibility for the water system and other infrastructure from the HOA in 2013. Today, all but 16 single-family lots are developed, with several under construction, and the subdivisions can be considered nearly built out.

The water system today exists largely as it was constructed beginning in 1996, with most components dating to the initial construction. Persistent problems the MRISD has faced include unaccounted water losses, high water usage, and insufficient supply during periods of highest demand.

The District boundary is shown in Figure 1.The location of Melody Ranch within the South Park area of Teton County is shown in Figure 2. It is located within the north half of Section 20, Township 40 North, Range 116 West, 6th P.M.

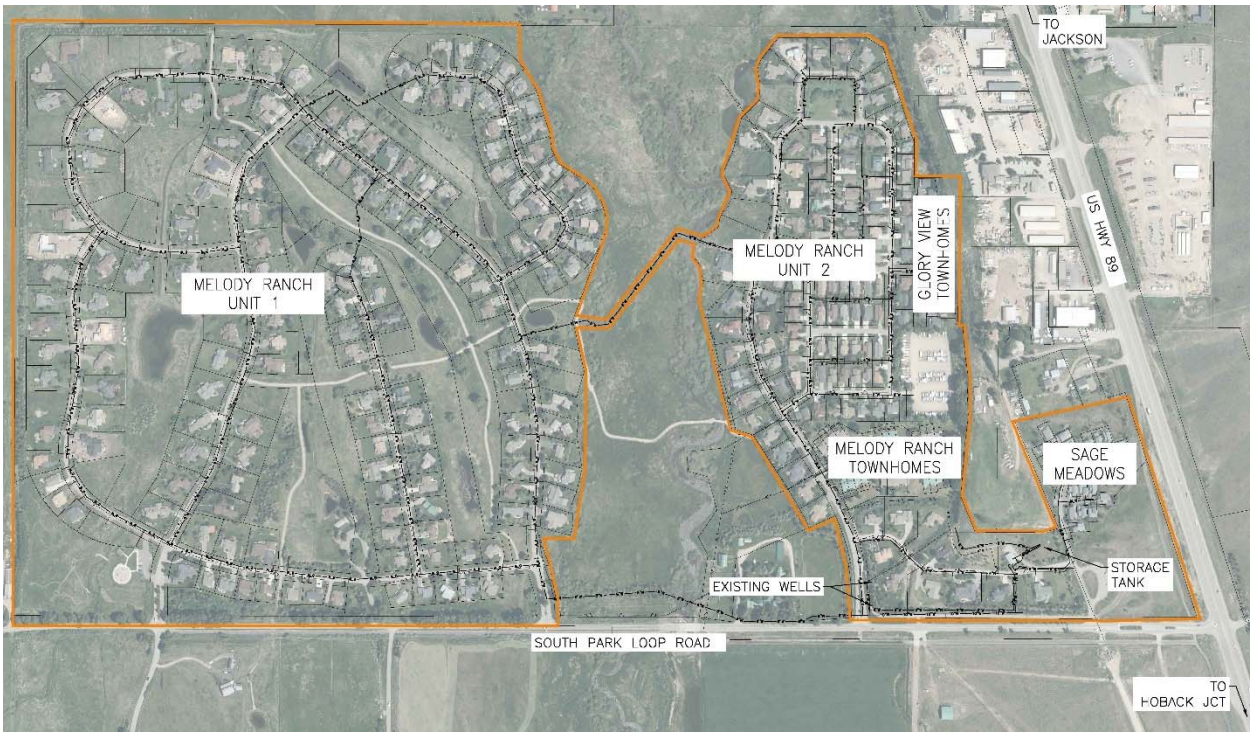

Figure 1 – District boundaries and subdivisions

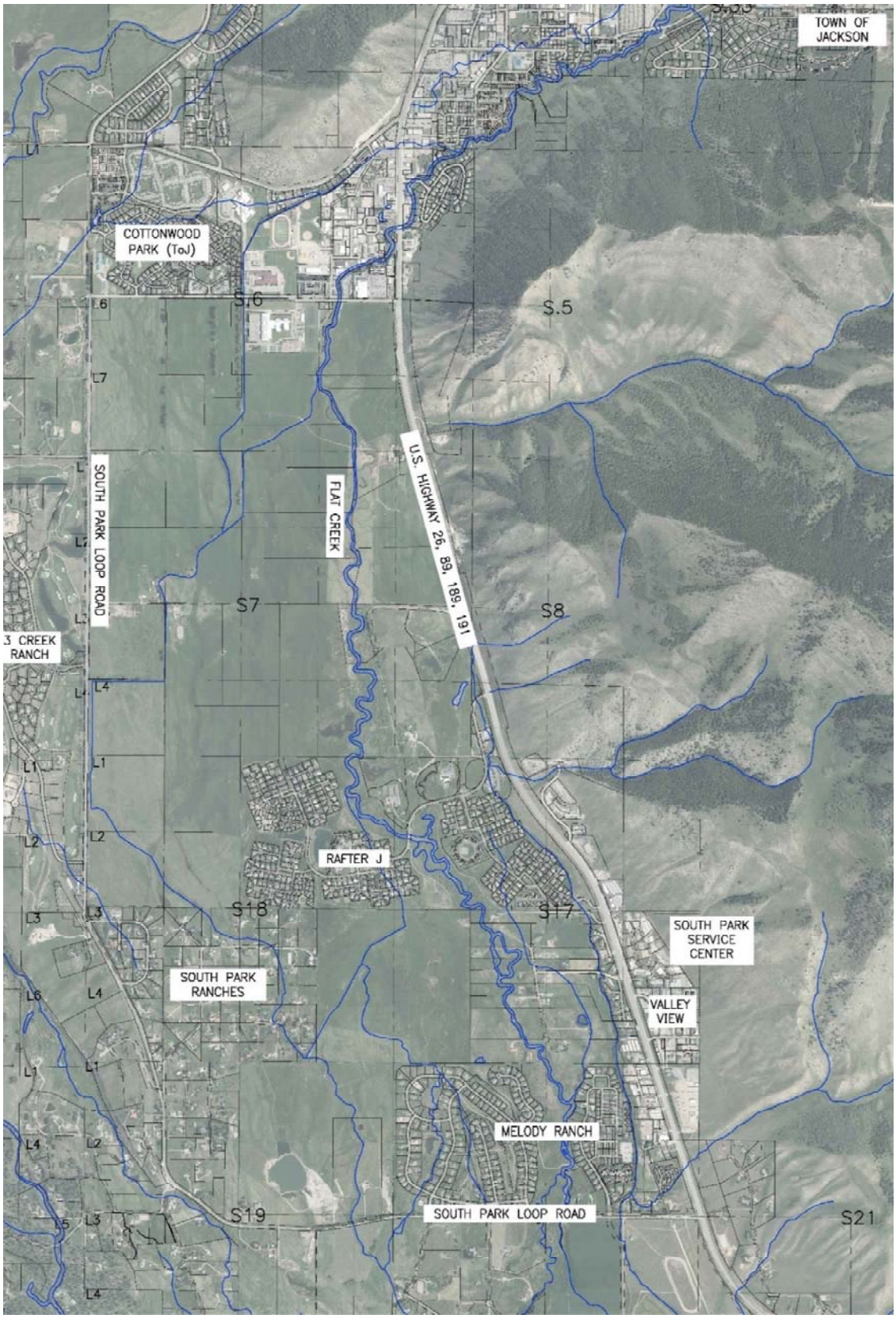

Figure 2 – Melody Ranch within South Park area, Teton County

2 Existing Public Water Supply System

For this project, NE completed a survey of the Melody Ranch above-ground water infrastructure, and inventoried water system components. Information obtained through the inventory was compiled into a GIS, used to develop a hydraulic model of the water system, and used to prepare recommendations.

2.1 Groundwater Supply

All municipal water to MRISD is supplied by two wells, Melody Ranch #1 and Melody Ranch #2. Both wells are located within an easement on Lot 87, Unit 2, 3rd Filing. The wells are both completed into the Snake River alluvial aquifer and were constructed in 1996 by Weber Drilling of Jackson.

Melody Ranch #1 (MR #1) is the southern of the two wells, water right Permit Number UW193269. It is completed to a depth of 123-ft. A 15-hp was installed when the well was constructed. This pump was replaced in October 2016 with a new pump and motor.

Melody Ranch #2 (MR #2) is the northern of the two wells, water right Permit Number UW193270. It is completed to a depth of 99-ft. The same 15-hp pump installed during construction is still operating today.

2.2 Storage

MRISD operates a single 300,000-gal buried concrete tank for finished water storage. It is located within the District boundaries, at the corner of Palomino and Sage Meadow Drives. The water surface elevation within the tank is not sufficient to provide adequate pressure throughout the system by gravity alone. In fact, the tank sits below some homes within MRISD. As a result, booster pumps are required.

2.3 Booster Pump Station and Pumps

Booster pumps to deliver water into the distribution system are located within a pump station building. The building also contains the chlorination system and backup generator. All water leaving the tank is pumped through the pump station to residents.

The booster pumps are comprised of four pumps; one pair of 15-hp pumps, and one pair of 50-hp pumps. The pumps are Peerless variable speed by means of Hydroconstant drives, and are twenty years old. The Hydroconstant drives are used to provide a variety of flows at constant pressure.

The existing booster pumps are quickly reaching the end of their useful life. Pumps and motors have been removed for repair and unplanned maintenance several times within the last two years. The pumps and motors are candidates for wholesale replacement with updated technology.

2.4 Distribution Pipe Network

The distribution pipe network consists largely of 8-in diameter C900 PVC pipe. There is a total of 31,500-LF of pipe. The existing isolation valves have been prone to leakage and damage due to corrosion of bonnet bolts. The District and operator have embarked on a work plan to replace valve hardware.

2.5 Water Use

Water use within MRISD is solely for residential purposes, with some incidental irrigation of open spaces. Water is not provided or sold to any other entities outside the ISD boundaries. Melody Ranch HOA

requires a significant investment in landscaping, and homeowners protect that investment with frequent irrigation. Irrigation of common areas is generally from separate irrigation systems using water not supplied by MRISD.

2.5.1 Average and Maximum Daily Demand

Table 1 below presents observed water demand for various seasons, and projected future demand.

Table 1 – Current water demand and future projections

When	Season	Average Daily Demand		Maximum Daily Demand		Peak Hour Demand	
		(gpd)	(gpm)	(gpd)	(gpm)	(gal/hr)	(gpm)
2016	Annual Avg	283,082	197				
	August - Max Month	628,483	436	943,000	655	78,600	1,310
	Summer	518,033	360				
	Winter	110,381	77				
Full Build Out	Annual Avg	302,048	210				
	August - Max Month	670,591	466	1,006,000	699	83,900	1,398
	Summer	552,741	384				
	Winter	117,777	82				

Annual average daily demand per lot was 820-gpd per lot in 2016. Maximum daily demand per lot was 2,700-gpd per lot in 2016. These values are high in comparison with other areas within Teton County. Winter average daily demand per lot was 320-gpd per lot, which is not out of the ordinary for homes that are on average about 3 bedrooms.

2.5.2 Unaccounted Water

A high proportion of MRISD water has been lost to leakage, unmetered irrigation, or otherwise unaccounted, over the history of the District. An analysis of recent unaccounted water shows it to be a significant problem for the District, summarized in Table 2. Unaccounted water has decreased since the previous year.

Table 2 - Unaccounted water by comparison of water produced vs water used

Year	Unaccounted Water			
	Annual (gal/yr)	Daily (gal/day)	Equivalent (gpm)	As % of Total Produced Water
2016 Annual	29,000,000	80,000	56	28%
Winter 2015-2016	n/a	62,000	43	56%
Summer 2016	n/a	111,000	77	21%

A leak detection survey of the distribution system was performed, and leaks identified for repair. Many of these leaks were at curb stops, and have been repaired. One distribution system isolation valve was positively identified as leaking, and is awaiting repair at the time of this writing. A desktop analysis indicates that no significant leakage from the tank is likely occurring.

3 Evaluation of Existing Water Supply

3.1 Ability to Supply Demands

The existing wells are limited in their ability to supply sufficient water to MRISD under some conditions:

- Production is barely able to meet maximum day demand with both wells in service.
- With one well out of service, summer average day demand can only be met by pumping 24 hr/day.
- With one well out of service, maximum day demand cannot be met.

3.2 Evaluation of Existing Wells

Evaluations of both Melody Ranch Well 1 (MR #1) and Melody Ranch Well 2 (MR #2) were completed by Wenck, including field testing and desktop analysis, to determine whether either or both could be equipped to produce more water for MRISD.

The evaluations were different for the two wells. For MR #1, aquifer testing with a higher capacity test pump was conducted in order to assess the condition and evaluate the sustainable yield. Aquifer tests of MR #1 consisted of both stepped and constant rate tests that were completed October 25 and 26, 2016. For MR #2, testing was performed using the existing pump, motor, and piping to evaluate the current pumping conditions of the well. Aquifer tests of MR #2 consisted of both stepped and constant rate tests that were completed on April 27, 2017.

3.3 Melody Ranch Well 1

Wenck has identified a sustainable yield for MR #1 of 800 gpm under current conditions. This pumping rate is twice the current production rate. While MR #1 can sustain a pumping rate of 800 gpm, the following recommendations are made if the pumping rate is increased:

- Using a variable frequency drive (VFD).
- Operating MR #1 and MR #2 separately. Pumping these two wells simultaneously will increase the water level interference and raise pumping costs.
- Upgrading the electrical service to MR #1 to meet the power requirements of a larger motor.
- Enlarging water rights associated with well.

3.4 Melody Ranch Well 2

Wenck has determined that the sustainable yield for MR #2 is in excess of 400 gpm under current conditions. Due to the limitations of the existing pumping equipment in the well, a specific sustainable pumping rate was not identified. The specific capacity results indicate that the sustainable pumping rate and well efficiency of MR #2 may be comparable to MR #1, which had a sustainable yield of 800 gpm based on 2016 testing. Similar improvements to those recommended for MR #1 would be required at MR #2. Additional testing and evaluation of the well should also be completed prior to setting a larger pump.

4 Recommended Improvements

4.1 Recommendation of Third Well

Nelson Engineering recommends development of a third municipal supply well to serve Melody Ranch for the following reasons. A third well would provide:

- Additional capacity to exceed maximum day demand,
- Redundant source of supply to meet maximum day demand,
- Ability to exceed average day demand with the largest well out of service,
- Ability to replenish tank after a fire under summer water use conditions.

To meet these goals, the proposed third well should produce 800-gpm.

The alluvial aquifer underlying Melody Ranch offers the best opportunity for developing an additional high capacity well for the District. This aquifer consists of saturated unconsolidated sedimentary deposits. Groundwater west of Flat Creek typically is of better quality than that to the east.

The top ranked drill site lies west of Flat Creek, and approximately 2,700 feet from the storage tank to the east, as shown on Figure 3. This site has great access for a drill rig and a transmission pipeline could be extended to this site along South Park Loop Road. The site is owned by the Melody Ranch HOA. Drilling depths of 150 to 200 feet are recommended.

To achieve the target yield of 800 gpm from this aquifer, Wenck recommends that a test well be completed using water-based direct rotary methods with 14-inch diameter casing and screen. Wenck recommends drilling a test hole at the MR HOA #1 site to confirm that subsurface hydrogeologic conditions are acceptable, to obtain lithologic samples, and to finalize the well design. If the test hole lithology is suitable, a new production well should be completed at this location.

4.2 Recommended System Improvements

Other improvements are recommended for the MRISD water system. A summary of the recommended improvements is provided in Table 3, below. Table 4, following, summarizes costs associated with the recommended improvements, in WWDC format.

The existing 6-in diameter transmission line running from wells MR #1 and MR #2 to the booster pump station is undersized and introduces excessive head loss into the system. If additional supply is developed, the transmission line must be upsized, at the same time as the new transmission line is constructed.

Upgrades to the pumps, motors, and electrical supply to the two existing wells are recommended. This will provide additional supply to the District, particularly valuable if one well is out of service.

NE recommends replacing the existing, twenty-year-old Hydroconstant pumps with new pump systems equipped with variable-frequency drives (VFDs). As distribution-system components, these improvements are not eligible for WWDC funding.

Figure 3 - Proposed Third Well and Transmission Pipeline

Table 3 - Summary of improvements

Recommendation	Key Benefits	WWDC Funding Eligibity	Priority	Time to Implementation	Land Ownership / Easement Issues
Distribution System Repairs - fix leaks, complete meter installation.	Reduce unaccounted water	No	High	Current	None
Drill Third Well - Includes testing and construction.	Provide additional supply and redundancy	Yes	High	WWDC Level III (2018), apply fall 2017	Well lot owned by MR HOA.
Construct Transmission Line - Segment 1, from existing wells to pump station.	Increased flow with decreased energy costs	Yes	High	WWDC Level III (2018), apply fall 2017	Construct within existing easements.
Construct Transmission Line - Segment 2, from future third well to near MR #1.	Required at time of third well.	Yes	High	WWDC Level III (2018), apply fall 2017	Construct within existing easements.
Upgrades to Existing Wells - Install larger pumps & motors	Increased supply without drilling new well	Yes	Moderate	WWDC Level III (2018), apply fall 2017	None
Booster Pump Replacement - Install new booster pumps, motors, and VFDs.	More efficient pump operation; reduced maintenance; replace aged pumps	No	Moderate	Construct with WWDC Level III	None

Table 4 - Recommended improvements cost estimate (2017 dollars)

Preparation of Final Designs and Specifications	$ 95,000	
Permitting and Mitigation	$ 15,000	
Legal Fees	$ 10,000	
Acquisition of Access and Rights of Way	$ 10,000	
Pre-Construction Costs (Subtotal # 1)		**$ 130,000**
Drill third well (WWDC Eligible)	$ 240,250	
Construct transmission line - Segment 1 (WWDC Eligible)	$ 181,850	
Construct transmission line - Segment 2 (WWDC Eligible)	$ 246,800	
Upgrades to existing wells (WWDC Eligible)	$ 94,600	
Booster pump replacement (WWDC Non-Eligible)	$ 180,000	
Distribution system repairs (WWDC Non-Eligible)	$ 23,150	
Total Component Cost (Subtotal #2)	**$ 966,650**	
Construction Engineering Cost (Subtotal #2 x 10%)	$ 96,665	
Components and Engineering Costs (Subtotal #3)	**$ 1,063,315**	
Contingency (Subtotal #3 x 15%)	$ 159,500	
Total Construction Cost (Subtotal #4)		**$ 1,222,815**
Total Project Cost (Subtotal #1 + Subtotal #4)		**$ 1,352,815**

5 Financing of Improvements

NE recommends advancing this project to final design and construction through the Wyoming Water Development program. WWDO staff have indicated that the project would be suitable for Level III construction funding given the scope of project contemplated here, and the characteristics of the Snake River alluvial aquifer. MRISD may proceed with all improvements recommended above in a single capital improvement project. Table 5, following, shows a breakdown of the proposed improvements using WWDC and DWSRF funding. Application to WWDC must be made by the MRISD Board prior to October 1, 2017, to be eligible for 2018 funding.

WWDC may provide 67% grant for eligible components. The remaining 33% may be funded by a loan through the DWSRF for 2% APR over 20-years. Debt service and some additional costs are borne by the District.

Table 5 - Financing of water system improvements

Description	Component Cost[1]	WWDC Eligible		DWSRF	
		67% Grant	33% Loan	100% Loan	with 25% Forgiveness
Distribution System Repairs - fix leaks, complete meter	$23,150	WWDC Ineligible		$23,150	
Drill Third Well - Includes testing and construction.	$240,250	$160,968	$79,283	$79,283	$59,462
Construct Transmission Line - Segment 1, from existing wells to	$181,850	$121,840	$60,011	$60,011	$45,008
Construct Transmission Line - Segment 2, from future third well	$246,800	$165,356	$81,444	$81,444	$61,083
Upgrades to Existing Wells - Install larger pumps & motors	$94,600	$63,382	$31,218	$31,218	$23,414
Booster Pump Replacement - Install new booster pumps,	$180,000	WWDC Ineligible		$180,000	$135,000
TOTAL	**$966,650**	**$511,545**	**$251,955**	**$455,105**	**$323,966**

MRISD can fund capital improvements, and/or debt service with revenue collected through the special district assessment, and water sales revenue. MRISD currently assesses $350 per lot, collected with Teton County property taxes. The water use fee is $1.40 per 1,000 gallons, with no tiers, and no base charge.

The District may consider raising either the per-lot assessment or water use rates to fund improvements. Additional revenue would be needed to fund any large capital improvement project. The water use fee could be increased uniformly; a tiered rate structure could be implemented; or the assessment could be increased. The District may use any or all of these options to increase annual revenue to cover the anticipated costs of servicing the expected loan.

Debt service related to the full capital improvement project could be about $80 per year per lot, depending on the funding sources used.

6 Regional Water Supply

Regionalization of the various water systems in the South Park area could be beneficial to several existing public and private water systems, with additional water supply, water storage, increased pressure, enhanced fire suppression, and potential cost savings. The following entities would potentially benefit from the economies of scale provided by a regional water system, also shown on Figure 2:

- Town of Jackson – southwest pressure zone
- Rafter J Improvement and Service District
- Teton County (Adams Canyon water system)
- South Park Service Center ISD
- Ridgeline ISD
- Melody Ranch ISD
- Valley View Mutual Water Company
- Lower Valley Energy
- South Park Village Water System
- O Bar B ISD
- Various private owners

A schematic design was developed, with the following cost estimate:

Table 6 - Regional water system cost estimate (2017 dollars)

Preparation of Final Designs and Specifications	$ 890,000	
Permitting and Mitigation	$ 250,000	
Legal Fees	$ 50,000	
Acquisition of Access and Rights of Way	$ 70,000	
Pre-Construction Costs (Subtotal # 1)		**$ 1,260,000**
Cost of Project Components (WWDC Eligible)	$ 13,802,000	
Cost of Project Components (WWDC Non-Eligible)	$ 915,000	
Total Component Cost (Subtotal #2)	**$ 14,717,000**	
Construction Engineering Cost (Subtotal #2 x 10%)	$ 1,471,700	
Components and Engineering Costs (Subtotal #3)	**$ 16,188,700**	
Contingency (Subtotal #3 x 15%)	$ 2,428,300	
Total Construction Cost (Subtotal #4)		**$ 18,617,000**
Total Project Cost (Subtotal #1 + Subtotal #4)		**$ 19,877,000**