ROBERT PECCIA & ASSOCIATES
HELENA, MT
KALISPELL, MT
BOZEMAN, MT

Memorandum

TO: WWC - Jeremy Fadness, PE
FROM: RPA - Austin Wargo PE
SUBJECT: Town of Sheridan Water and Wastewater Capacity Review
DATE: March 30, 2022

WWC (Western Water Consultants) Engineering has contracted with RPA (Robert Peccia and Associates) to provide and independent water and wastewater capacity analysis for the Town of Sheridan, MT. A subdivision is being proposed in Sheridan that consists of 53 single-family units and 30 multi-family units. The purpose of this memorandum is to summarize the findings of the independent water and wastewater capacity review of the Town of Sheridan.

WATER SYSTEM

Water System Capacity

The Sheridan water system consists of groundwater wells for a water source, transmission mains, distribution system, and a steel storage tank. The capacity of the water system is shown in **Table I**. The ability of the distribution system to deliver water was not included in this review and is assumed to be adequate. A hydraulic model with the proposed subdivision should be used to ultimately confirm improvements that are not needed to deliver water to the proposed development.

Table 1: Water System Capacity

STORAGE CAPACITY	
Storage Tank	**Capacity (Gallons)**
At Grade Steel Storage Tank	300,000
SOURCE WATER CAPACITY	
Well	**Capacity (GPM)**
Well #1	50
Well #2	Not Operational
Well #3	Not Operational
Well #4	Not Operational
Well #5	150
Well #6	225
Total Production	**375***
Total Production with Largest Producing Well Out of Service	**200**

**Well #5 and Well #6 pump 50 gpm less when both wells are in service*

Helena
3147 Saddle Drive
P.O. Box 5653
Helena, MT 59601
Tele: 406.447.5000
Fax: 406.447.5036
www.rpa-hln.com

Water System Demands

The water system currently serves approximately 694 residents. Water production records from the last 5 years were used to develop demands. **Table 2** has the established historic demands for the water system.

Table 2: Existing Population Water System Demands

Produced Water Demands		
	Demand	**Unit**
Average Day Demand	115,000	GPD
Maximum Day Demand	332,000*	GPD
Peak Demand	448,500**	GPD
Average Gallons Per Capita Day	166	GPCD
Maximum Gallon Per Capita Day	478	GPCD
Fire Flow Demands		
Flow (GPM)	**Time (hours)**	**Volume (Gallons)**
800	2	96,000
Minimum Fire Flow Demands per IFC		
1500	*2*	*180,000*

**2021 Maximum day was used, since it was highest demand that occurred in the recent years since the water projects were completed and water loss decreased. The 2017 maximum day flow occurred prior to improvements being constructed in 2020.*

*** Assumes peaking factor of 3.9.*

Table 2 shows a fire flow demand of 800 gallons per minute for 2 hours. It was reported that this is what is required by the Fire Chief in Sheridan. This flow, however, is lower than what is often targeted in other communities. International Fire Code 2012, which Montana has adopted, has a minimum fire flow of 1,500 gallon per minute for 2 hours. Overall review is based on the 800 gallons per minute required by the Fire Chief

Water Capacity Verse Demands

Water system capacity requirements in Montana are outlined in MDEQ Circular 1. In Sheridan, the applicable requirements pertain to storage tank sizing and groundwater source sizing. The rules pertaining to storage tank sizing and groundwater well production are as follows:

> *7.0.1 Storage facilities must be sufficient, as determined from engineering studies, to supplement source capacity to satisfy all system demands occurring on the maximum day, plus fire flow demands where fire protection is provided.*
>
> *7.0.1.a The minimum allowable storage must be equal to the average day demand plus fire flow demand, as defined below, where fire protection is provided.*
>
> *3.2.1.1.a The total developed ground water source capacity for systems utilizing gravity storage or pumped storage, unless otherwise specified by MDEQ, must equal or exceed the design maximum day demand with the largest producing well out of service. Storage must comply with the requirements of Section 7.0.1.*

With these rules as the basis for sizing the water system, **Table 3** shows the available capacity in the water system.

Table 3: Water System Capacity vs Demand

STORAGE CAPACITY VS DEMAND		
Storage Analysis Per MDEQ Circular 1 - 7.0.1		
Maximum Day Demand	332,000	Gallons
Fire Flow*	96,000	Gallons
Storage Capacity	300,000	Gallons
Source Capacity	540,000	Gallons
Available Capacity	**412,000**	**Gallons**
Storage Analysis Per MDEQ Circular 1 - 7.0.1.a		
Average Day Demand	115,000	Gallons
Fire Flow*	96,000	Gallons
Storage Capacity	300,000	Gallons
Available Capacity	**89,000**	**Gallons**
WELL CAPACITY VS DEMAND		
Maximum Day Demand	332,000	Gallons
Well #1 Production	72,000	Gallons
Well #5 Production	216,000	Gallons
Well #6 Production	324,000	Gallons
Total Well Production with Largest Out of Service	288,000	Gallons
Available Capacity	**-44,000**	**Gallons**

**This analysis assumed fire flow at 800 gallons per minute for 2 hours. This fire flow is likely low which would affect available storage capacity. If fire flow was 1500 gallons per minute for 2 hours only 5,000 gallons of storage would be available.*

Table 3 shows that current storage is adequate for the existing demands and meets the requirements of MDEQ Circular 1 7.0.1.a. **Table 3** also shows that the existing demands exceed available water source capacity according to MDEQ standards.

It should also be noted that the Town of Sheridan has been on water use restrictions the last few years. Water use restrictions will decrease average day and maximum day demands. If water use restrictions are removed, it is expected that available storage capacity will decrease and well capacity will be in a further deficit.

Development Impacts on Water System

The new development is proposing 53 single-family units and 30 multi-family units. For this analysis it is assumed that an average of 2.3 people live per single family unit and 4.6 people per multi-family units. With this assumption the new subdivision will add a total of 276 people to the water system. Impacts to the water system can be seen in **Table 4**.

Table 4: Develop Impacts to Water System

ADDITIONAL DEMANDS WITH SUBDIVISION		
Average Gallons Per Capita Day	166	GPCD
Maximum Gallon Per Capita Day	478	GPCD
Development Population	276	People
Development Average Day Demand	45,816	Gallons
Development Maximum Day Demand	131,928	Gallons
Current Available Storage Capacity	89,000	Gallons
Current Well Capacity	-44,000	Gallons
Available Storage Capacity after Development	**43,184**	**Gallons**
Available Well Capacity After Development	**-175,928**	**Gallons**

Table 4 shows the Town of Sheridan does not have adequate source capacity to meet the current demands. For the Town to accept the new development a new source should be developed with a minimum production of 123 gallon per minute.

Table 4 shows that there is available storage for the proposed development.

WASTEWATER SYSTEM

Wastewater System Capacity

The Sheridan wastewater system consists of a gravity collection system, a primary lift station that pumps into an aerated pond, an intermediate lift station that pumps to three storage ponds, and a land application irrigation system that is used for ultimate disposal of wastewater. The collection system consists mainly of vitrified clay pipe. A few improvements have been made to the collection since it was installed, including a lining project. It is reported that the collection system has substantial I&I (inflow and infiltration). The I&I issues mainly occur in the summer when groundwater levels are higher and irrigation ditches are in use. The treatment system was constructed in 2011, and the design criteria for the treatment system is listed in **Table 5**.

Table 5: Existing Wastewater Treatment System Design Criteria

DESIGN CRITERIA FROM 2011 IMPROVEMENTS		
Average Daily Flow	252,400	GPD
Maximum Daily Flow	322,730	GPD
Peak Hourly Flow	316	GPM
Design Peak Factor	1.8	
Lift Station #1/#2 Design Pump Flow	400	GPM
Aerated Pond Volume*	4.86	MG
Aerated Pond Detention Time	19	DAYS
Storage Pond #1 Volume	12.64	MG
Storage Pond #2 Volume	10.04	MG
Storage Pond #3 Volume	10.84	MG
Total Storage Capacity	33.52	MG
Total Storage Retention Time at Design Flow	133	DAYS

**Volume on construction drawings design criteria is 9.2 million gallons, this volume has been determined to be incorrect per as-builts 4.86 million gallons is the correct volume.*

Table 5 shows a total storage of 133 days based on average day flow. The system was designed using storage during the winter months flow rate when I&I is reduced. The storage retention time is much greater in the winter with reduced wastewater flows, and the current system has adequate storage.

Current Wastewater System Flows

Around the same time when the wastewater treatment system improvements were completed, a collection system project was completed. The projects' main goal was to reduce I&I in the collection system. Therefore, to properly evaluate the capacity of the wastewater system updated flows need to be evaluated based on the current flow data. Available data for updating flows was only available between April 1, 2020 and September 16, 2020. This time period actually provides a higher average day flow than can be anticipated since this time period has the highest flow rates of the year due to I&I. **Table 6** shows the current wastewater system flows based on available data and current treatment system detention times.

Table 6: Existing Population Wastewater System Flows

CURRENT WASTEWATER SYSTEM FLOWS		
Current Average Daily Flow	139,200	GPD
Current Maximum Daily Flow	176,205	GPD
Current Gallons per Capita Day	201	GPCD
Current Peaking Factor	3.2	
Current Peak Hour Flow	306	GPM
Current Aerated Pond Detention Time	35	DAYS
Current Aerated Pond Detention Time at Max Day	28	DAYS
Current Storage Capacity at Average Day	241	DAYS

As shown in **Table 6**, the current wastewater system has significant available capacity. The peaking factor was modified by RPA from the original design criteria since I&I has been reduced. Peak hour flows were developed using the maximum day estimated I&I flow plus average day demand based on 100 gallons per capita day multiplied by a peaking factor developed from MDEQ Circular 2 11.243.b. This resulted in an overall peaking factor of 3.2.

Development Impacts on Wastewater System

The additional flows from the development can be added to the system and remain below capacity. **Table 7** shows the expected wastewater flows and retention time based on the new development. No, I&I is added to the new development since it is assumed the system will be watertight. Flows are assumed to 100 gallons per capita day. The new development will have a population of 276 people as developed above.

Table 7: Development Impacts on Wastewater System

DEVELOPMENT IMPACTS ON WASTEWATER SYSTEM		
Development Population	276	
Develop Gallons per Capita Day	100	GPCD
Develop Average Daily Flow	27,600	GPD
Peak Hour Factor for Subdivision	4.09	
Peak Hour for Subdivision	78	GPM
Approximate Lift Station Pumping Flow Rate	155	GPM
Peak Hour Flow After Development*	384	GPM
Average Day After Development	166,800	GPD
Maximum Day After Development	203,805	GPD
Aerated Pond Retention Time at Average Day	29	DAYS
Aerated Pond Retention Time at Maximum Day	24	DAYS
Storage Pond Retention Time at Average Day	201	DAYS
Irrigation Capacity is Assumed to be Adequate Since Average Day Flow is Less than Design Average Day Flow		

**It is assumed the development lift station will pump into the distribution system and the pumped flow will be buffered prior to entering the influent wet well, so peak hour of the development was added to peak hour of the current system. If the developments lift station pumps directly into the influent lift station wet well peak hour flow would need to use the development pump flow rate and would be greater than influent wet well pump capacity.*

The wastewater treatment system appears to have adequate capacity to treat the additional wastewater from the development. The component in the treatment system that appears to be limiting Is the influent lift station. As noted in the foot note of **Table 7** this lift station may be undersized depending on where the developments lift station is connected.

SUMMARY

The Sheridan water supply does not have source capacity for the proposed development. Water storage appears to be adequate based on current fire flow established by the Fire Chief. The wastewater system appears to have adequate capacity for the proposed development based on the information that was provided.

Sincerely,
ROBERT PECCIA & ASSOCIATES

Austin Wargo, PE
Project Manager