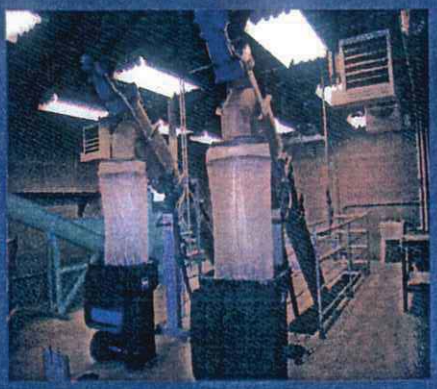
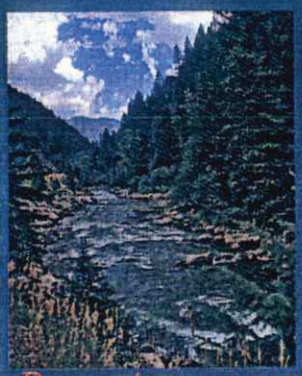
Preliminary Engineering Report
Canyon Area Wastewater Treatment And Disposal





Prepared For
Wastewater Solutions Forum



Preserving water quality while planning for the future.

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November 2008

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1.0 EXECUTIVE SUMMARY

1.1 PLANNING AREA

The Big Sky County Water and Sewer District 363 straddles the Gallatin and Madison County line and contains 4,094 acres. The District currently provides water and sewer service to two fairly distinct areas, the Mountain Village area and the Meadow Village area. The Meadow Village area is located in Gallatin County while the Mountain Village area is located in Madison County. The District's eastern most boundary is located approximately 2 miles from Highway 191. Development along the Highway 191 corridor has raised concerns over potential impacts to the Gallatin River water quality. This feasibility study was conducted to determine alternatives available to protect the water quality of the Gallatin River while allowing development to continue.

The "Study Area" or lower canyon area, as it is often referred to consists of 5,092 acres although only 1,594 acres is suitable for development. The remaining land is either public land or within the flood plain.

1.2 NEED FOR PROJECT

The combination of a shallow aquifer supplying drinking water in the study area and the proliferation of septic tanks represents a high potential for contamination of drinking water. A review of the Source Water Delineation and Assessment Reports (See appendix K) shows that three of the Public Water Systems in the study area have had a total of 18 positive coliform tests in the last 5 years. Based on the SWDARs the aquifer in the study area is assigned a high sensitivity to potential contamination sources located in the area. The susceptibility of many of the wells in the study area is rated as high or very high by the SWDARs. Based on the number of positive coliform tests from the public water supply systems in the area it is likely that many of the private home wells would also test positive for coliforms. At the very least, wells in the area are highly susceptible to contamination and the problem will only get worse if more septic tank and drainfield systems are installed within the study area

This project is intended to allow growth in the study area to occur while providing protection to the Gallatin River that would exceed the protection afforded by an Outstanding Resource Water (0RW) designation. Under the ORW designation, nutrient loadings of nitrate and phosphorous would be limited to levels determined to be non-significant. However, the current development in the study area already far exceeds the levels that would be allowed under the ORW designation. Providing a central sewer system, with treatment at the District's plant, would reduce the nutrient loadings below the levels that could be obtained under the ORW designation and would eliminate the existing nutrient loads. Table 1-1 shows the nutrient loadings to the Gallatin River under the various treatment alternatives considered in this report.

Table 1-1
Comparison of Nutrient Loading to the Gallatin River

Scenario	Nitrate Loading to Gallatin River Pounds per Year	Phosphorous Loading to Gallatin River Pounds per Year
ORW Designation	4,007.8	400.7
Existing Conditions	4,456.0	2,524.5
No-Action	7,779.6	3,436.0
Treatment Alternative T1-B MBR Plant	2,396.3	159.7
MBR With Advanced Treatment	159.7	159.7

1.3 GROWTH AND POPULATION TRENDS

Due to the pattern of population fluctuations in a resort community it is difficult to determine permanent population numbers. Gallatin County has shown an approximate growth rate of 2.9% per year since the 2000 census but 2007-2008 census estimates are not yet available for the Big Sky area. The District's record of Single Family Equivalent (SFE's) connections to the sewer system shows an average 5.6% annual increase from 2000 to 2007. The annual average flow at the treatment plant has increased 5.74% during the same time period. For this study, a 5.6% annual growth rate has been assumed.

The study area currently has zoning regulations and land use classifications. For each zoning classification an allowed dwelling unit density is specified. Density bonuses can be obtained by preserving higher percentages of land in open space. Conditional use permits (CUP's) are also allowed which have the potential to add to the dwelling density. Table 1-2 shows the projected full build-out flows, for the study area, both with and without CUP's.

Table 1-2
Projected Full Build-out Flow From Study Area –

Zoning Classification	Gross Area	Reduced[1] Area	Dwelling[2] Units	Future Flows[4] *NO CUP's (gpd)*	Future Flows[3] *CUP's Allowed (gpd)*
RC-SF-1 (1 unit/acre)	360 acres	240 acres	240	45,814	91,627
RC-SF-5 (1 unit/5 acre)	774 acres	519 acres	212	20,091	40,181
RC-SF-20 (1 unit/20 acres)	327 acres	227 acres	11	2,153	4,347
R-SF-7500 (1 unit/750 0sf)	361 acres	251 acres	1,129	213,476	640,332
R-MF-3500 (1 unit/3500sf)	56 acres	33 acres	369	69,300	69,300
Community & Commercial	252 acres	252 acres	2,232	620,000	558,000
Community Facilities	14 acres	14 acres	N/A	3,900	3,900
Recreational Business	58 acres	58 acres	N/A	119,460	119,460
	Average Daily Flow in gallons per day			**1,094,194**	**1,527,147**
		Peaking Factor *(Flows)*		**2.76**	**2.61**
		Peak Flow in gallons per minute		**2,097**	**2,767**

1.4 PROJECTED FLOWS AND LOADING

Flows from the study area are not expected to reach the full-build out level during the 20 year planning period used in this report. The major facilities in the study area have permitted wastewater systems with allowed discharges of 76,543 gallons per day. At a 5.6% annual growth rate for 20 years, the projected average day flow from the study area would be 283,000 gallons per day. The current average day flow at the District's treatment plant is approximately 330,000 gallons per day. At a 5.6% annual growth rate, the projected average day flow from the current District is 1,220,000 gallons per day. Combining projected flows from the study area and the District results in a projected average day flow of 1.5 Million Gallons per Day (MGD) in 2030 and a projected peak day flow of 3.15 MGD. At an annual average day flow of 1.5 MGD a total of 548 million gallons of treated wastewater is available for reuse.

1.5 COLLECTION SYSTEM ALTERNATIVES

Six alternative types of sewer collection system were considered in this report. These included:

- Standard gravity
- Small diameter gravity
- Small diameter pressure systems with septic tanks (STEP system)
- Small diameter pressure with grinder pumps and without septic tanks.
- Vacuum assist sewers
- No Action

The first four alternatives listed were evaluated in more depth with advantages and disadvantages of each system considered along with estimated operation and maintenance costs. The system with the lowest estimated present worth is the small diameter pressure system with grinder pumps. The estimated present worth of the four systems evaluated is shown in Table 1-3. It should be noted that non-monetary issues favor the conventional gravity system.

Table 1-3
Present Worth of Collection System Alternatives

Alternative	Total Project Cost	First Year O&M Cost	Present Worth of O&M Cost	Salvage Value	Present Worth
C-1 Conventional Gravity Sewer	$ 10,384,024		$ 280,109	$ 3,567,100	$ 7,097,033
		$ 19,100	$ -		
C-2 Small Diameter Gravity	$ 9,712,814		$ 317,653	$ 3,268,700	$ 6,761,766
		$ 21,660	$ -		
C-3 STEP System	$ 8,501,600		$ 352,263	$ 2,472,200	$ 6,381,663
		$ 24,020	$ -		
C-4 Pressure Sewer With Grinder Pumps	$ 8,417,600		$ 314,940	$ 2,421,800	$ 6,310,740
		$ 21,475			
Inflation =	2	%			
Interest =	5	%			
Period	20	years			

1.6 TREATMENT ALTERNATIVES

Treatment alternatives considered in the initial screening included:

- Expanding the District's current plant with the addition of a third SBR basin
- Converting the existing plant to a Membrane Bioreactor (MBR)
- Provide advanced treatment for removal of trace constituents
- Constructing a new treatment plant serving only the lower canyon area
- Continue using level 2 on-site treatment systems with drainfields in the study area

Expanding the District's current plant, with the addition of a third basin would not provide the required treatment capacity and was not considered further. Continued use of level 2 treatment is in essence a no-action alternative since it would be a continuation of the current situation. The use of level 2 treatment systems was thoroughly evaluated in the EIS prepared by the Montana Department of Environmental Quality. The use of level 2 systems is considered a viable alternative until a collection and treatment system can be installed. An overall cost for the entire study area to use level 2 treatment systems has not been estimated as part of this study.

The present worth cost of the treatment alternatives considered is shown below in Table 1-4. Since alternative T1-C is an add on treatment to alternative T1-B the cost shown for T1-C includes the capital and O&M costs associated with alternative T1-B.

Table 1-4
Present Worth Cost of Treatment Alternatives

Alternative	Capital Cost	Annual O&M Cost	Present Worth of O&M Cost	Salvage Value	Present Worth
T1-B MBR Treatment	13,809,337	1,310,100	16,326,742	2,588,513	27,547,565
T1-C Advanced Treatment	23,340,574	1,540,502	19,198,055	4,917,035	37,621,594
Interest =	5%				
Period =	20	years			

1.7 DISPOSAL/REUSE ALTERNATIVES

Disposal alternatives considered in this report include:

- Alternative D-1 Snowmaking
- Alternative D-2 Land Application (summer irrigations)
- Alternative D-3 Subsurface Disposal i.e. drainfields or shallow injection wells
- Alternative D-4 Injection wells- both deep well and shallow wells
- Alternative D-5 Surface water Disposal
- Alternative D-6 Treating to reuse standards and installing a non-potable distribution system for reuse in selected applications.
- Alternative D-7 Evaporation of portion of the water to minimize storage requirements.

The District currently irrigates the Meadow Village golf course and has the ability to irrigate on the Yellowstone Mountain Club course. The Meadow Village course is estimated to have an irrigation capacity of 144 million gallons per year(MGY) and the YMC is obligated by agreement to provide disposal sites for 160 MGY for a total disposal capacity of 304 MGY. Snowmaking is a viable alternative to dispose of over 250 MGY but it is expected that additional pilot testing will be required before snowmaking would be approved by MDEQ for use in areas where the public would have unrestricted access. Using a snowmaking process would reduce the amount of storage ponds that would have to be constructed if irrigation remains the only disposal option.

Subsurface drainfields are a viable option but the cost/gallon of water is high and large disposal sites suitable for use are difficult to find.