EXECUTIVE SUMMARY

DRAFT FACILITY PLAN FOR IMPROVEMENTS TO THE BIG SKY WASTEWATER TREATMENT FACILITY

ENGINEERS/PLANNERS

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BIG SKY WASTEWATER TREATMENT FACILITY

Introduction

The purpose of this summary is to present the highlights of the "Draft Facility Plan" for the Big Sky Wastewater Treatment Improvements. The summary includes a description of the existing wastewater treatment facility and a discussion of the future needs for wastewater treatment at Big Sky and of the alternatives that have been proposed for improving the system. The detailed analysis of the existing facility and alternatives for improvements to the facility are contained in the "Draft Facility Plan".

The "Draft Facility Plan" contains seven chapters as indicated below:

1.0	SUMMARY
2.0	INTRODUCTION
3.0	PLANNING AREA
4.0	EXISTING CONDITIONS
5.0	FUTURE CONDITIONS
6.0	ANALYSIS OF ALTERNATIVES
7.0	EVALUATION OF ALTERNATIVES

This summary attempts to explain the information presented in these chapters without dealing extensively with numerical and analytical details.

Existing Conditions

The Big Sky Wastewater Treatment Facility serves the area covered by the Rural Improvement District (RID 305) which was formed in the early 1970's to fund the existing sewer system. The planning area for the development of the "Facility Plan" has been assumed to conform to the boundaries of the existing RID 305.

The existing Big Sky Wastewater Treatment Facility is located east of the Meadow Village commercial area approximately two miles west of the junction of US Highway 191 and Montana Spur 64.

Geologically, the treatment facility is located on an outwash terrace formed by alluvial deposits of glacial meltwater. This terrace separates the South Fork (of the West Fork) from the Middle Fork (of the West Fork). The terrace deposit is over bedrock consisting of relatively impervious claystones and shales. The present day stream bed of the South Fork and Middle Fork are incised into the bedrock and are therefore hydraulically uncoupled from the terrace deposits. This means that the groundwater levels in the terrace would not be effected by rising or lowering surface flows in the streams.

The South Fork and Middle Fork converge downstream of the Big Sky Wastewater Treatment Facility and then flow into the West Gallatin River. The available water quality data shows that the streams have very low levels of pollutants.

The number of users of the Big Sky Wastewater System is expressed in terms of Single Family Equivalents (SFE's). An SFE establishes a standard basis for comparing different types of developments. Establishing the number of SFE's associated with each development takes into account the number of bedrooms, number of baths over

two, hotel/motel units, swimming pools and hot tubs, and a full range of commercial operations. Big Sky currently has 1,648 SFE's developed with a potential future development of 6,334 SFE's. The SFE's are useful for predicting wastewater flows since a volume of flow can be assigned to each SFE.

The present wastewater flows have been determined from flow meter readings taken since 1987. The flows include domestic flows generated by users of the sewer system and infiltration and inflow to the system from groundwater and surface water sources. The flows vary seasonally with the highest domestic flows occurring during the winter and summer and the highest infiltration and inflow occurring during the spring. The current total annual flow is 89 million gallons (MG) which consists of 50 MG of domestic flow and 39 MG of infiltration and inflow. The domestic flow is equivalent to 83 gallons per day per SFE.

The present wastewater treatment facility consists of one 8.2 million gallon (MG) aeration pond, two storage ponds of 13.5 MG and 34.3 MG, a recirculation pump station, a chlorine contact tank, and a golf course irrigation system. The treatment system was intended to store the treated wastewater over the winter and then irrigate the golf course during the summer with the stored water. Since all of the effluent was intended to be disposed of by application on the golf course there was to be no discharge into the stream or groundwater and a permit for discharging effluent was not required.

There are several deficiencies with the present treatment facility. These are:

1. The winter efficiency of the pond in treating the wastewater is only about 80 percent.

2. The total storage capacity is 47.8 MG which is not large enough to store the winter and early spring effluent. Therefore, the excess water leaks into the ground and seeps into the South Fork and Middle Fork. If the ponds had been lined to prevent this seepage, the storage ponds would most likely overflow.

3. The long term capacity of the golf course to dispose of effluent by irrigation is estimated at 43 million gallons per year. Therefore, less than half of the current effluent can be disposed of by irrigating the golf course.

Future Conditions

Detailed studies have been done to determine the future requirements for the Big Sky Wastewater Treatment System. The design parameters needed for designing a wastewater treatment facility are the flow entering the facility, the load (amount and type of pollutants), and the quality of effluent required. The design parameters for Big Sky are discussed below.

FLOWS

Future wastewater flow was estimated by projecting the increase in historic flows. For the design of the improvements to the wastewater treatment system, flows projected to the year 2012 were used. The design flow recommended is an average daily flow of 0.574 million gallons per day (MGD) and a peak daily flow of 1.45 MGD. This compares to the existing average daily flow of 0.24 MGD and peak daily flow of 0.6 MGD.

It is important to note that the recommended design flows given

above do not correspond to the flows that would be expected after full development has taken place. At full development, the flows would be more than twice as great as the recommended design flows. Incidently, full development is projected to occur in approximately 46 years.

LOADS

In addition to the flow estimates, the load for the wastewater treatment facility must be determined. Since Big Sky does not expect industrial development, the load for the facility will be typical of that expected for domestic sewage. The design load consist of organic loading which is expressed in terms of the biological oxygen demand (BOD) and suspended solids contained in the wastewater. The recommended organic loading for the Big Sky wastewater treatment facility is 960 pounds per day of BOD_5 with a peak value of 2400 pounds per day. The recommended suspended solids is 1129 pounds per day with a peak value of 2822 pounds per day.

EFFLUENT QUALITY

The quality of effluent needed depends upon the method of disposal. Three disposal systems are typically considered: 1) land application by spray irrigation, 2) infiltration into the ground water and 3) discharge into surface water. The last two methods require a discharge permit from the Montana Department of Health and Enviornmental Sciences.

Land application consists of piping the effluent to an irrigation system for disposal. Irrigation is generally done on relatively flat land which will sustain good plant growth. In the Big Sky area, irrigation can only be done during the plant growth season so

storage of the effluent is required in the winter. Land disposal could also be accomplished by making snow from the effluent; however, the snow making equipment would probably not be permitted on steep slopes in order to prevent runoff into surface water. Land application requires the least amount of pretreatment since the system is designed for the crops to uptake the pollutants.

Infiltration consists of constructing ponds to receive the effluent which is then infiltrated into the groundwater. The water quality required for groundwater infiltration is covered in the Montana Water Quality Act. A permit is required for discharge. This legislation has a non degradation rule which applies to ground water which requires the effluent to be equal or better than the existing ground water. The Water Quality Bureau will consider granting a waiver to this non degradation rule which would permit infiltration after advanced secondary treatment of the wastewater. Advanced secondary treatment would require a treatment plant since an aerated lagoon could not treat to the high water quality standards required.

Surface discharge would require a permit to discharge directly into the stream or river. The non degradation rule also applies to surface discharge. In order to meet water quality standards to discharge into waters at Big Sky, treatment beyond advanced secondary treatment would be required. A petition process exists for petitioning the Water Quality Board to allow a lowering of the quality of high quality waters. This process is a lengthy one requiring development of an Environmental Impact Statement and holding of public hearings. However, if it is apparent that there are significant advantages to discharging to surface water, it may be advisable to take this approach.

Analysis of Alternatives

The type of sewage treatment facility that is selected depends on the method of disposal of the treated wastewater. As stated above, the effluent is normally disposed of by spray irrigation, infiltration, or discharge into surface water. In all cases the wastewater must be treated before being discharged. The amount of treatment will depend upon the type of disposal system selected.

LAND APPLICATION

For land application the level of pretreatment required may be considerably less than for discharge into surface water because it is not generally permissible to discharge water that is of lower quality than the water in the stream or river receiving the water. Land application systems include: 1) spray irrigation with the effluent, 2) rapid infiltration into the ground and 3) injection of the effluent into deep wells.

Spray irrigation at Big Sky will ultimately require a land area of 1350 acres. This includes 165 acres from the golf course and 1185 acres from lease of state or federal land or the acquisition of private land. Spray irrigation would not require a permit for discharging into ground water or surface water. Treatment of the effluent would consist of a two cell, 15.5 MG aerated lagoon and 164 MG of storage capacity for storing the winter flows. Approximately 40 - 60 acres would be required for the lagoons and storage ponds. The treated effluent would be pumped to the spray irrigation site. The golf course would receive part of the effluent and the remainder would need to be pumped to a site in the Porcupine area approximately five miles from the present wastewater treatment facility, or a similar site.

Rapid infiltration involves infiltrating the effluent into the ground through basins constructed in a pervious material such as gravel. Rapid infiltration requires a permit since the effluent discharges into the ground water. The effluent must be treated to a higher level than can be provided by an aerated lagoon. Therefore, secondary treatment in a treatment plant employing a Sequencing Batch Reactor or an Oxidation Ditch, would be required.

Deep well injection involves pumping the effluent into a deep permeable formation. The formation would have to be below important drinking water bearing aquifers which would require injection wells at least 2000 feet deep. Since the effluent from wastewater treatment processes contains bacteria and nutrients, there is a good probability that injection wells would be subject to clogging. Review authorities from the Montana Department of Health and Environmental Sciences are not in favor of this method of wastewater disposal without extensive study and have never approved any similar systems in Montana. For these reasons, the deep well injection is not considered to be a feasible alternative.

DISCHARGE TO SURFACE WATER

Discharge to surface water consists of disposing of the treated effluent in a river or stream. Discharge to surface water requires a permit which specifies the quality of the effluent that can be discharged. Consequently the treatment design is based on the provisions of the discharge permit. At Big Sky, it would only be feasible to discharge into surface water if a waiver to the non degradation rule were granted. If such a waiver were obtained, it is anticipated that the wastewater would still have to be treated to a very high quality. This would require a treatment plant using the best technology available for feasible removal of nutrients.

Evaluation of Alternatives

Several alternatives are evaluated below in terms of the location and physical features of the treatment facility, the type of treatment, the type of disposal used, and the cost. The location of the pre treatment (aeration lagoon or advanced treatment plant) is assumed to be at the existing site for all of the alternates. Costs would increase approximately $600,000 if pre treatment were moved to the Michener Creek area because additional pipe and pumping would be needed to pump the treated water back to the golf course for irrigation. Costs are based on equivalent uniform annual costs over a planning period of 20 years. Details of the economic comparisons are given in the "Draft Facility Plan".

Spray Irrigation in the Porcupine Creek Area

This alternate would dispose of the effluent by spray irrigation in the Porcupine Creek area and on the golf course. The existing facility would be upgraded by expanding the existing lagoon system at the present site and constructing new storage ponds at the Michener Creek Site.

COST OF SPRAY IRRIGATION

1.	Transfer line to storage:	$ 1,174,500
2.	New storage pond:	3,228,000
3.	Irrigation system:	4,077,500
4.	Upgrade aerated lagoon:	2,956,200
	Subtotal:	$11,436,200
	Contingency 15%:	$ 1,715,400
	Subtotal:	$13,151,600
	Engineering and Legal 15%:	$ 1,972,700
	TOTAL:	**$15,124,300**

Rapid Infiltration Basins at Michener Creek Area

This alternate would dispose of the effluent through infiltration basins constructed at the Michener Creek site. Treatment of the wastewater would be by either the Sequencing Batch Reactor or an Oxidation Ditch constructed at the present site. Since preliminary studies indicate that the geologic conditions at the Michener Creek area may not allow the total flows to be naturally infiltrated, some underdrain system or groundwater control drains may be necessary to collect excess groundwater generated by the infiltration basins. This excess would then have to be discharged at the surface and some variance to the non-degradation rule would be required.

COST OF RAPID INFILTRATION

1.	Pretreatment, Sequencing Batch Reactor:	$ 2,458,400
2.	Transfer lines to basins:	1,342,800
3.	Rapid infiltration basins:	447,900
	Subtotal:	$ 4,249,100
	Contingency 15%:	$ 637,400
	Subtotal:	$ 4,886,500
	Engineering and Legal 15%:	$ 733,000
	TOTAL:	**$ 5,619,500**

Discharge to Surface Water

As stated above, discharge to surface water will require a variance to the non degradation rule. This option would provide treatment at the present site with discharge to the South Fork of the West Fork of the West Gallatin River. Some of the effluent would be stored during the winter for spray irrigation of the golf course. The cost given below for this alternative assume that a permit

would be granted which would require secondary treatment followed by filtration of effluent. If the permit were more restrictive, additional treatment such as reverse osmosis or ion exchange would be required and the cost would increase accordingly.

COST OF DISCHARGE TO SURFACE WATER

1.	Sequencing Batch Reactor:	$ 2,458,400
2.	Post filtration:	839,200
	Subtotal, Unit Processes:	$ 3,297,600
	Contingency 15%:	$ 494,600
	Subtotal:	$ 3,792,200
	Engineering and Legal 15%:	$ 568,800
	TOTAL:	**$ 4,361,000**

Future Expansion Beyond the 20-Year Planning Period

Future expansion beyond the 20 year planning period should be considered in the plan because of the potential demand for additional land. The spray irrigation disposal is the most demanding of land, and since there is little relatively flat land available, expansion would be limited. Rapid infiltration may require additional land for infiltration basins. However, if an underdrain system were used to collect the water, the amount of additional land may be quite small. Discharge to surface water would require little additional land since the treatment plant could be expanded with very little additional land required. Expansion of the aeration lagoons and storage for spray irrigation would require additional land roughly in proportion to the amount of expansion needed.

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