FILE COPY
12/94

# INTERIM ACTION WORK PLAN

for

# WASTEWATER TREATMEMT AND DISPOSAL

at

# BIG SKY, MONTANA

*HKM Associates, Engineers/Planners*
*2727 Central Avenue*
*P.O. Box 31318*
*Billings, Montana 59107-1318*
*Phone (406) 656-6399*
*Fax (406) 656 6398*

*Billings, Bozeman, & Miles City, MT*
*Sheridan, Wyoming*

# INTERIM ACTION WORK PLAN

for

# WASTEWATER TREATMEMT AND DISPOSAL

at

# BIG SKY, MONTANA

*HKM Associates, Engineers/Planners*
*2727 Central Avenue*
*P.O. Box 31318*
*Billings, Montana 59107-1318*
*Phone (406) 656-6399*
*Fax (406) 656 6398*

*Billings, Bozeman, & Miles City, MT*
*Sheridan, Wyoming*

## TABLE OF CONTENTS



## LIST OF TABLES



## LIST OF FIGURES



## LIST OF APPENDICES

# INTERIM ACTION WORK PLAN

## INTRODUCTION

On July 13, 1993 the Water Quality Bureau issued a Compliance Order to Rural Improvement District 305 (RID 305) to make improvements to the District's wastewater treatment facility. The Compliance Order required the District to submit an Interim Action Work Plan outlining the steps the District will take to enhance water conservation, improve treatment, and reduce inflow and infiltration.

Subsequent to the issuance of the Compliance Order, the voters approved the creation of the Big Sky County Water and Sewer District 363 (District). After a review of assets and liabilities, the District assumed the responsibilities of RID 305 on February 16, 1994.

The District instructed HKM Associates to prepare an alternative Interim Action Work (IAWP) Plan on September 21, 1994. This report outlines the Interim Action Work Plan prepared by HKM Associates. The District is submitting this IAWP to the Water Quality Bureau to satisfy the requirements of the Compliance Order.

The Interim Action Plan discusses steps the District will implement to:

- Improve treatment
- Reduce infiltration and inflow
- Conserve water

## METHODS TO IMPROVE WASTEWATER TREATMENT

### Aeration Improvements

The Compliance Order requires the Interim Plan to address measures that can be used to improve treatment to reduce the existing $BOD_5$

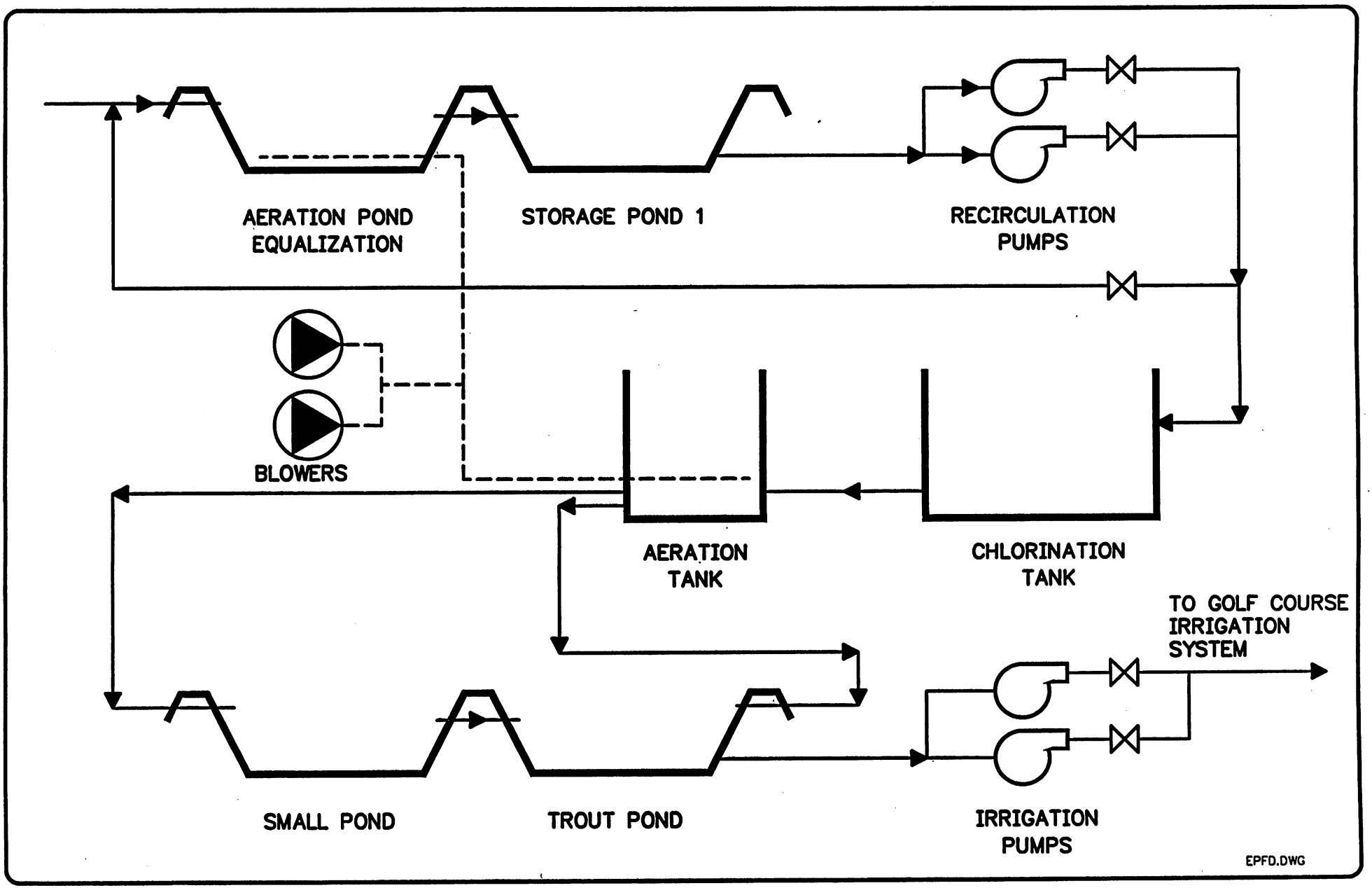
load on state waters. It is the intent of the interim plan to improve treatment levels by improving the aeration system and expanding the spray irrigation system. The following discussion addresses the specific approach being presented in the interim plan.

The existing treatment system consists of one aerated cell and two storage ponds. Figure 1 shows the process flow diagram for the existing treatment system. The two storage ponds have volumes of 13.6 MG and 27.5 MG. Water from storage pond 1 is pumped to the chlorine contact chamber. From the chlorine contact chamber the water flows by gravity to the trout pond. Irrigation water for the golf course is pumped from the trout pond.

The existing aeration system is extremely inefficient. From visual observation it appears that only 1 or 2 of the subsurface aerators are functioning. A large bubble of air in the southeast corner of the existing pond indicates that one of the air lines may be ruptured. The reaction rate coefficient, calculated from the existing data, also indicates a poor aeration efficiency.

Due to the inefficiency of the current aeration system, we recommend that a new aeration system be installed in the existing aeration basin. In addition, the existing aeration basin would be split into two basins by the addition of a baffle curtain.

A review of the flow and load data from August 25, 1993 through September 4, 1994 indicates the average influent $BOD_5$ concentration was 185 mg/l and the average daily flow was 0.25 MGD. However, during the ski season, December 15th through March 29th, the influent $BOD_5$ concentration averaged 297 mg/l at a flow of 0.261 MGD. In order to meet the higher loads during the ski season, it is recommended that six 5 HP aerators be installed in the first aeration cell and that two 5 HP aerators be installed in the second aerated cell. Figure 2 shows the layout for the recommended



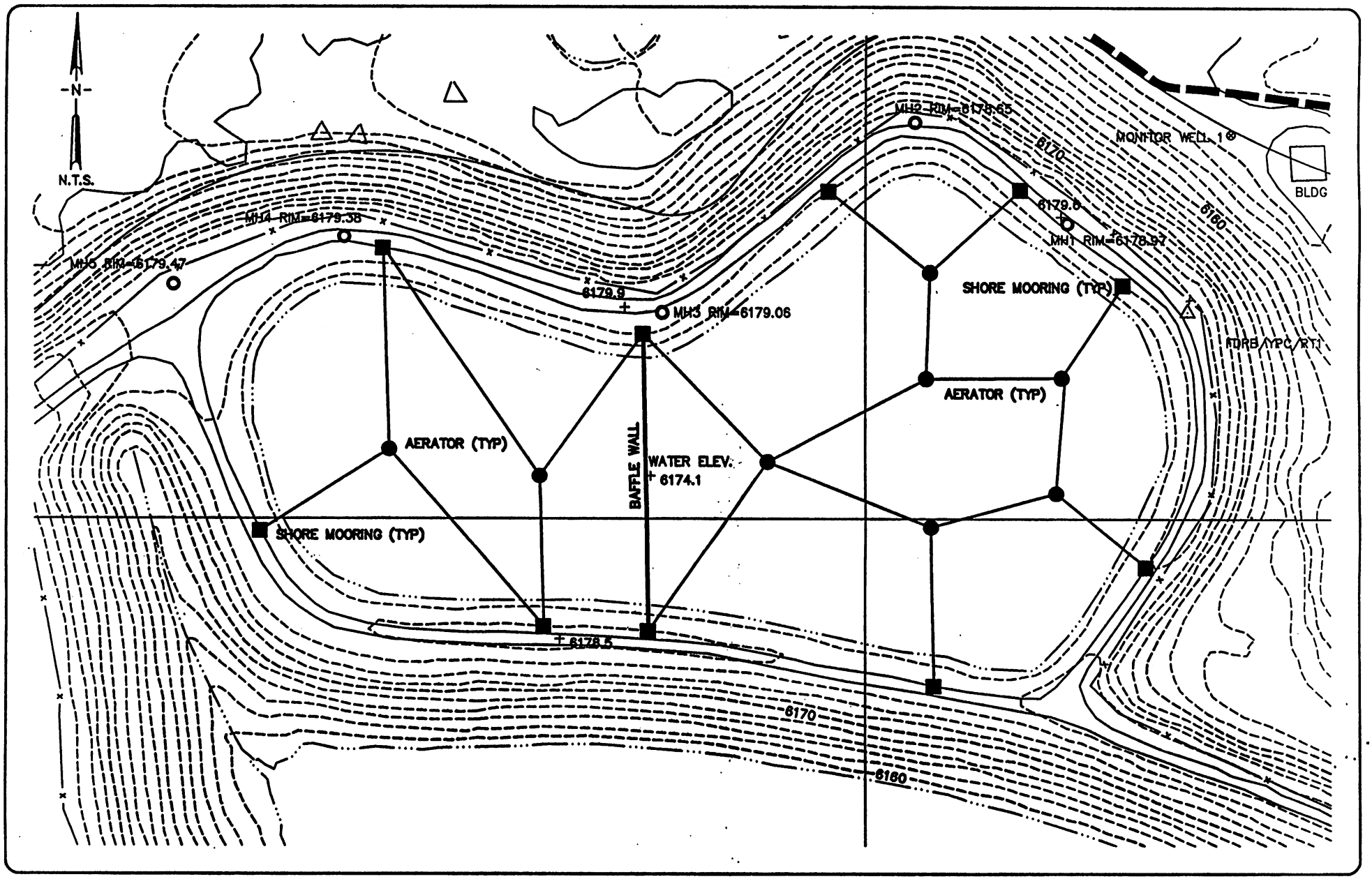

BIG SKY INTERIM ACTION PLAN

EXISTING PROCESS FLOW DIAGRAM

FIGURE 1

HKM ASSOCIATES
ENGINEERS · PLANNERS

| | |
|---|---|
| 4M357.102 | SEPT 1994 |




# BIG SKY INTERIM ACTION PLAN
# PROPOSED AERATION ADDITION

FIGURE 2

HKM ASSOCIATES
ENGINEERS · PLANNERS

| 4M357.102 | DECEMBER 1994 |
|---|---|

improvements. Calculations are attached in Appendix A for the aeration sizing and the level of treatment projected with the aeration system modifications. The treatment calculations show the actual influent and aerated effluent concentrations from August 25, 1993 to September 14, 1994 along with the projected treatment levels with the improvements recommended.

With the modifications, the majority of the treatment will be confined to cells that are lined, thus reducing the $BOD_5$ load on state waters. Also, by confining the aeration to the current aeration basin, the storage cell can continue to be drawn down completely in the summer and fall irrigation season. With the additional 40 acres of land for irrigation, it is beneficial to maintain as much storage volume as possible.

The Compliance Order stipulates that new construction may only be connected to the sewage system if it can be demonstrated that the connection will not result in $BOD_5$ loading to state waters that exceed the Department approved Maximum Annual Load. The Department also has to issue written approval of the plan. The maximum annual load was set at 9,333 pounds of $BOD_5$ in an April 8, 1994 letter from the Water Quality Bureau. Calculations in Appendix A show that with the recommended improvements, the annual $BOD_5$ load on state waters from leakage in the storage cell is estimated at 3,077 pounds.

The estimated cost to install the 8-five horsepower aerators and baffle curtain is shown in Table 1.

| Table 1<br>Estimated Cost for Aeration Improvement | | | | |
|---|---|---|---|---|
| ITEM | QUANTITY | UNITS | UNIT COST | TOTAL COST |
| 5-HP Aerator | 8 | Ea. | $ 7,000.00 | $56,000.00 |
| Mooring Cables & Posts | 1 | L.S. | $ 5,300.00 | $ 5,300.00 |
| Baffle Curtain | 1 | L.S. | $ 8,000.00 | $ 8,000.00 |
| Electrical | 1 | L.S. | $26,500.00 | $26,500.00 |
| | | | Subtotal | $95,800.00 |
| | | | 10% Contingency | $ 9,580.00 |
| | | | Subtotal | $105,380.00 |
| | | | Contractor Overhead and Profit | $26,345.00 |
| | | | Subtotal | $131,725.00 |
| | | | Engineering | $17,000.00 |
| | | | TOTAL | $148,725.00 |

Irrigation Improvements

The $BOD_5$ load on state waters can be reduced through improved treatment and through increased irrigation. The District has received a verbal commitment for 40 additional acres of undeveloped land that can be irrigated in the Interim Plan. Assuming a final agreement for the 40 acres of land can be obtained this winter, the irrigation system on the undeveloped land could be installed in the spring of 1995 and would allow increased irrigation without disrupting the golf course.

The current golf course irrigation system covers approximately 93 acres. Under the long range plan the golf course irrigation system would also be expanded from the current 93 acres to 182 acres. The additional 40 acres would increase the current irrigation capacity by approximately 43 percent.

The irrigation system improvements would include installing approximately 3800 feet of 4-inch PVC line to the irrigation site. It is estimated another 1000 feet of pipe would be needed at the site. The line to the site would be buried at a shallow depth. The 1,000 feet of line at the site would not be buried. A 15-HP trailer mount pump would be used to pump to the irrigation gun. A single 100 gpm travelling irrigation gun would be used to apply approximately 1.0 inches over the 40 acres every 8 days.

The cost estimate for the irrigation improvements are shown below in Table 2.

Table 2
Irrigation Improvements

| ITEM | QUANTITY | UNITS | UNIT COST | TOTAL COST |
|---|---|---|---|---|
| Irrigation gun | 1 | Ea. | 16,000.00 | $16,000.00 |
| 4-Inch PVC Pipe Buried | 3800 | L.F. | 9.00 | $34,200.00 |
| 4-Inch PVC Pipe On-site | 1000 | L.F. | 5.00 | $5,000.00 |
| 100-GPM 15 HP Pump Station | 1 | L.S. | 4,500.00 | $ 4,500.00 |
| | | | SUBTOTAL | $59,700.00 |
| | | | 10% CONTINGENCY | $ 5,970.00 |
| | | | SUBTOTAL | $65,670.00 |
| | | | ENGINEERING | $ 9,200.00 |
| | | | TOTAL | $74,870.00 |

## INFILTRATION AND INFLOW REDUCTION

The Water and Sewer District has been actively inspecting and repairing sewer lines where sources of infiltration have been located. This program will be continued. Appendix B contains a list of lines that have been repaired during 1993 and 1994 and lines that are slated for repair during 1995.

In comparing the 1994 flows at Big Sky with past years it is evident that substantial progress has been made in reducing infiltration flows. Table 3 shows a monthly comparison of the 1994 flows, January through October, with the 1991 and 1993 flows. (Note: The flow recorder was not functioning properly in 1992).

Table 3
Monthly Flow Comparison - Million Gallons

| | 1991 | 1993 | 1994 |
|---|---|---|---|
| January | 5.8 | 7.2 | 7.07 |
| February | 6.5 | 7.3 | 6.99 |
| March | 7.8 | 9.2 | 9.82 |
| April | 5.1 | 6.9 | 7.84 |
| May | 15.9 | 16.3 | 5.08 |
| June | 14.0 | 13.5 | 5.88 |
| July | 10.1 | 14.8 | 8.50 |
| August | 8.6 | 12.5 | 7.14 |
| September | 5.6 | 14.0 | 6.87 |
| October | 2.8 | 6.0 | 3.66 |
| Total | 82.2 | 107.7 | 68.85 |

Table 3 shows the 1994 flows have dropped 16.2 percent from 1991 and 36.1 percent from 1993. The flow reduction is most apparent during the high groundwater and runoff period of May through September. Considering the period of May through September the 1994 flows have dropped 38.2 percent from 1991 and 52.9 percent from 1993. Consistant with the flow reduction, the $BOD_5$ concentration from July through October 1994 have doubled from the 1993 levels; 120 mg/l versus 245 mg/l. The flow reductions presented above are based on the total flow.

In the draft wastewater facility plan, the domestic component of flow for January through October of 1993 was estimated at 46.8 million gallons and the I/I component was estimated at 60.9 million

gallons. Assuming the domestic flow component in 1994 was similar to 1993 levels indicates that the I/I component of flow was reduced to 22.05 million gallons; approximately 1/3 the 1993 level.

As indicated by the above discussion the District has made substantial progress in reducing I/I flows. The District intends to continue the aggressive repair program started in the summer of 1993.

Past flow monitoring and TV inspections have all occurred in the summer and fall after the high flow period has passed. This has made it difficult to confirm high infiltration areas even when the TV inspection shows cracked or broken pipe. If the crack is above the seasonal high water table, leakage will be minimal. The District will undertake a flow monitoring program during April, May and June of 1995 to identify high flow reaches. Monitoring will be conducted at the manholes listed in Table 4.

Table 4
Monitoring Manholes

| AREA | MANHOLE # |
|---|---|
| Sky Crest | 292 |
| Stillwater | 313 |
| Turkey Leg | 296 |
| Sitting Bull | 300 |
| Low Dog | Flume |
| Outfall Line | 112 |
| Hidden Village | 131 |
| Yellowtail | 15 |
| West Fork Meadows | 51 |
| Sweet Grass Hills | 91 |
| Spotted Elk | 80 |
| Wastewater Plant | Flume |

Quick insert flumes will be installed at each manhole for easy monitoring. The manholes listed above are key manholes in that the flow from small drainage basins can be measured individually. If a high flow from a drainage basin is identified, additional flow monitoring will be done in the drainage basin to further isolate large I/I sources. Once high I/I reaches are identified, the past TV tapes can be reviewed for potential I/I sources.

As discussed in the Summary Report of Infiltration and Inflow prepared in March of 1994, the manholes listed in Table 5 should be inspected for leakage during periods of high groundwater. The percentage shown in parenthesis represents the percentage of manholes in each area that will be inspected.

Table 5
Manholes to be Inspected

| AREA | MANHOLE NUMBER |
|---|---|
| Lone Mtn./S. Bull<br><br>(29% inspected) | 300<br>303<br>342<br>343<br>346<br>350<br>353<br>352 |
| White Otter/Sioux Sitting Bull<br><br>(44% inspected) | 301<br>328<br>329<br>331<br>332<br>336<br>340 |
| Lake<br><br>(100% inspected) | 294<br>295<br>296<br>297<br>298<br>299 |

| Table 5<br>Manholes to be Inspected | |
|---|---|
| Lower Manholes on Low Dog<br><br>(10% inspected) | 291<br>293<br>279<br>275<br>274<br>273<br>258<br>251 |
| Hidden Village<br><br>(17% inspected) | 131<br>144<br>147<br>148 |
| Lone Mountain Guest Ranch (8%) | 155 |
| Crazy Horse (7%) | 209 |
| Little Coyote (10% inspected) | 86<br>108 |
| Spotted Elk (20% inspected) | 83 |
| Yellowtail (13% inspected) | 38 |
| Black Otter (3%) | 12 |
| Dam/Heavy Runner (17% inspected) | 318<br>319 |
| Low Dog<br><br>(80% inspected) | 313<br>314<br>316<br>317 |

These manholes were repaired in 1986 and 1987 by grouting. It is possible that the grouting is no longer effective and needs to be redone.

A review of these manholes will begin in the spring during high groundwater conditions. In addition to inspecting the preceding manholes, the District is considering methods to plug the holes in the manhole lids and to improve the seal around the frame.

A precise estimate of the cost to repair the manholes cannot be made until the manholes are inspected. However, assuming 25 manholes will be repaired at a cost of $600 each the manhole

repairs will cost $15,000. The $600 cost includes installing manhole lid plugs, a manhole lid gasket, an internal chimney seal and an internal joint seal.

## CONSERVATION MEASURES

### Water Conservation Devices and Ordinances

In addition to the public education program, the District will undertake active measures to reduce flow through encouraging owners to change to low flow shower heads and to replace older high volume toilets with new low volume toilets. The District is investigating a two charge rate structure. However the District's legal counsel has indicated a two charge structure may have legal implications that would make such a structure difficult to implement. In essence, establishment with older fixtures would be penalized even though the fixtures were "legally installed". However even without the two charge system the District has received letters from the major system users who have committed to changing to low flow showers and low flush toilets. (See Appendix E).

The District has adopted Resolution 94-01 (Appendix D) which deals with eliminating inflow sources such as floor drains, roof drains, and foundation drains. While foundation drains are no longer allowed in new construction, the District is also investigating alternatives for removing the existing drains or metering the flow so an equitable charge can be assessed.

The water and sewer district is currently developing a building ordinance to ensure water conservation measures are used in new construction. Unlike federal policy which exempts commercial establishments from water conservation fixtures the District ordinance will require low flow fixtures, for both residential and commercial construction. A copy of the draft ordinance is included in Appendix D. The District's attorney is currently reviewing the ordinance to make sure it does not conflict with state building

codes which already require low flow fixtures. Assuming there are no problems with the District's ordinance it is scheduled to be adopted and implemented by February 1, 1995.

An ordinance regulating septic systems within the District has been adopted and is currently in effect. A copy of the ordinance is also included in Appendix D. The ordinance is designed to compel hookup to the District's system in order to prevent a large number of private systems in a populated area.

Public Education

The District has already started a public education program by notifying all Big Sky owners of the need to conserve water. A copy of the mailing sent to the owners is included in Appendix C. As indicated by the response letters in Appendix E some of the largest owners have already agreed to change to high efficiency fixtures.

The District has also made initial contact with the Montana Watercourse to develop an education program suitable for Big Sky. Possible programs include project WET (Water Education for Teachers) and Adult Water Awareness Programs. It is expected that programs developed through the Montana Watercourse will be reviewed by the District staff during the first part of 1995 and suitable programs would be instituted as-soon-as possible. If suitable brochures are developed they would be distributed as soon as they became available. The District will work with the Ophir School to include programs, such as project WET, in the school curriculum.

The school program is a worthwhile education program and should be included in the Interim Action Work Plan. However, because water use at Big Sky is largely due to a transient tourist population, school based programs will have little or no impact on tourist's water use habits. In order to reach the majority of the water users, an information packet or brochure that emphasizes water conservation will be placed in each motel room and condominium.

In addition to the information brochure in the rooms, a weekly notice will be placed in the local newspapers. The notice will be a short informational notice emphasizing the need for water conservation and the impacts of water use on the wastewater system. A sample notice is included in Appendix C. We believe a weekly notice in the newspaper will be more effective in reaching the tourist population than a series of articles.

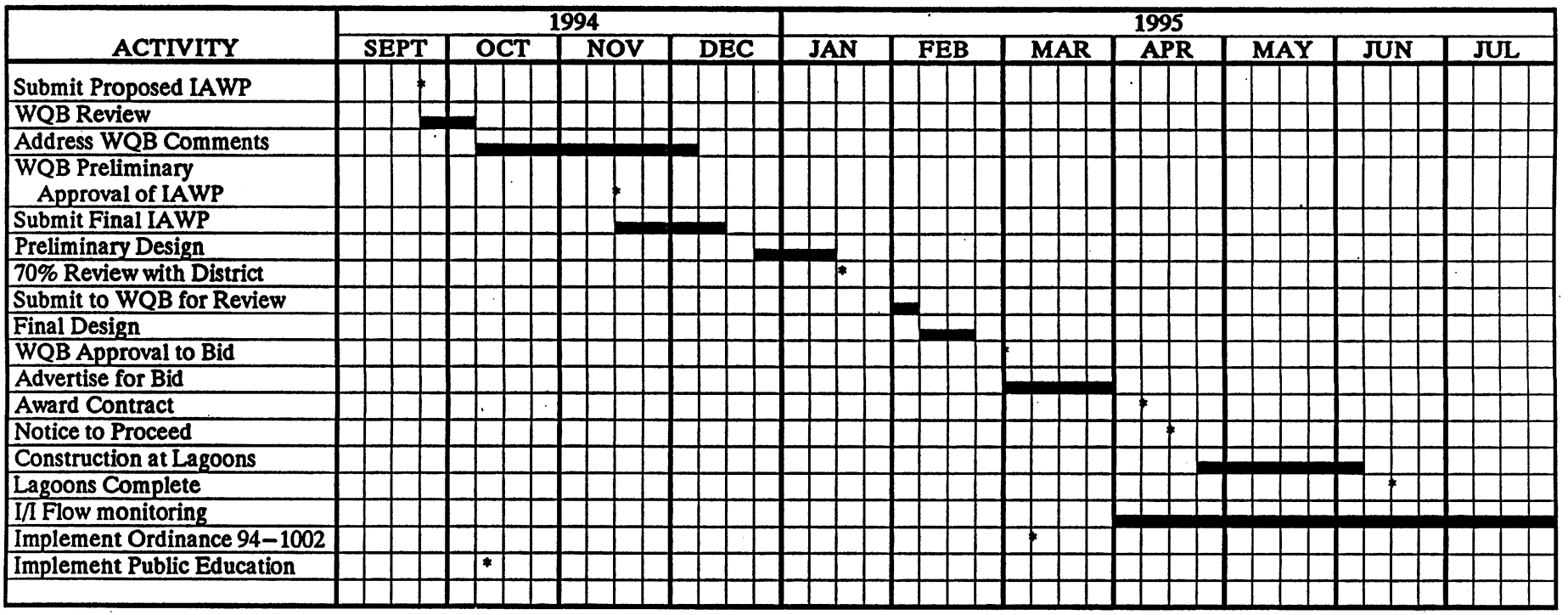
The cost for the public education program is estimated at approximately $750.00. This cost would include printing 5000 post card size notices that would be mailed to current homeowners in the District. It is assumed the notices would be replaced on an as needed basis in motel rooms and condominiums by the housekeeping staff. It is assumed that the program at Ophir School would be developed largely through the District and school staff with assistance from the Montana Water Course. Therefore no personnel approximately $300 to $400 for the purchase of curriculum materials at Ophir School.

## SCHEDULE

Figure 3 shows the anticipated schedule for implementing the interim plan. As the schedule shows, assuming approval of the IAWP, work could begin in the spring as soon as weather will permit.

## SUMMARY

The proposed IAWP will result in a substantial decrease in the $BOD_5$ load on state water while still being compatible with the long range plan. With the improved aeration and added irrigation the $BOD_5$ load on state water is projected to be reduced to 3,077 pounds per year. A $BOD_5$ loading of 3,077 pounds would be approximately one-third of the maximum annual load allowed under the compliance order.




# BIG SKY INTERIM ACTION PLAN
## PROPOSED SCHEDULE

FIGURE 3

HKM ASSOCIATES
ENGINEERS · PLANNERS

4M357.102 | DECEMBER 1994

The District has worked diligently to repair sewer lines identified as potential sources of I/I. The work completed in 1993 has been very successful as I/I flows in 1994 are approximately 1/3 of the 1993 levels. The success of the 1994 repairs will not be known until the spring of 1995. It is expected that the monitoring conducted as part of this IAWP will focus the repairs to high inflow areas.

# APPENDIX A

BIG SKY AERATED LAGOON PERFORMANCE DATA–MODIFIED IAWP

| DATE | FLOW GALLONS | FLOW MGD | INFLUENT MG/L | ACTUAL AERATED EFFLUENT MG/L | MODEL PROJECTION AERATION EFFLUENT MG/L | MODEL PROJECTION ST. POND EFFLUENT MG/L |
|---|---|---|---|---|---|---|
| 25–Aug–93 | 2479183 | 0.354 | 90 | 54 | 13 | 7 |
| 01–Sep–93 | 2266415 | 0.324 | 125 | 42 | 17 | 8 |
| 08–Sep–93 | 2441806 | 0.349 | 123 | 37 | 18 | 9 |
| 17–Sep–93 | 3456800 | 0.384 | 138 | 34 | 23 | 13 |
| 22–Sep–93 | 1822686 | 0.365 | 188 | 29 | 29 | 16 |
| 29–Sep–93 | 3564950 | 0.509 | 127 | 30 | 28 | 18 |
| 12–Oct–93 | 2532720 | 0.195 | 122 | 106 | 8 | 3 |
| 19–Oct–93 | 1257962 | 0.180 | 56 | 31 | 3 | 1 |
| 27–Oct–93 | 1912742 | 0.239 | 71 | 32 | 6 | 2 |
| 02–Nov–93 | 808725 | 0.135 | 290 | 23 | 11 | 2 |
| 10–Nov–93 | 1159531 | 0.145 | 72 | 70 | 3 | 1 |
| 17–Nov–93 | 807549 | 0.115 | 216 | 20 | 6 | 1 |
| 01–Dec–93 | 1948960 | 0.139 | 131 | 23 | 5 | 1 |
| 08–Dec–93 | 1113215 | 0.159 | 164 | 32 | 8 | 2 |
| 15–Dec–93 | 1324760 | 0.189 | 300 | 32 | 19 | 6 |
| 21–Dec–93 | 1329332 | 0.222 | 322 | 42 | 25 | 9 |
| 29–Dec–93 | 2521710 | 0.315 | 302 | 54 | 39 | 19 |
| 03–Jan–94 | 1657828 | 0.332 | 311 | 70 | 42 | 22 |
| 11–Jan–94 | 1981963 | 0.248 | 286 | 72 | 27 | 11 |
| 18–Jan–94 | 1675139 | 0.239 | 244 | 76 | 22 | 8 |
| 25–Jan–94 | 1752460 | 0.250 | 269 | 78 | 25 | 10 |
| 02–Feb–94 | 1776226 | 0.222 | 266 | 62 | 21 | 8 |
| 07–Feb–94 | 1159056 | 0.232 | 299 | 81 | 25 | 10 |
| 16–Feb–94 | 2073007 | 0.230 | 316 | 78 | 26 | 10 |
| 23–Feb–94 | 1987308 | 0.284 | 366 | 87 | 41 | 18 |
| 02–Mar–94 | 2021097 | 0.289 | 320 | 106 | 37 | 17 |
| 09–Mar–94 | 1974888 | 0.282 | 194 | 110 | 21 | 10 |
| 16–Mar–94 | 1985731 | 0.284 | 333 | 103 | 37 | 17 |
| 29–Mar–94 | 3842922 | 0.296 | 322 | 106 | 38 | 18 |
| 06–Apr–94 | 2453836 | 0.307 | 172 | 118 | 21 | 10 |
| 13–Apr–94 | 1698581 | 0.243 | 133 | 115 | 12 | 5 |
| 19–Apr–94 | 1538939 | 0.256 | 45 | 72 | 4 | 2 |
| 25–Apr–94 | 2146293 | 0.358 | | 72 | | |
| 03–May–94 | 2031533 | 0.254 | 47 | 58 | 5 | 2 |
| 11–May–94 | 1744588 | 0.218 | 48 | 50 | 4 | 1 |
| 18–May–94 | 1280929 | 0.183 | 95 | 44 | 6 | 2 |
| 25–May–94 | 1242959 | 0.178 | 86 | 32 | 5 | 1 |
| 01–Jun–94 | 1306038 | 0.187 | 96 | 40 | 6 | 2 |
| 08–Jun–94 | 1450292 | 0.207 | 130 | 45 | 9 | 3 |
| 15–Jun–94 | 1634910 | 0.234 | 145 | 48 | 12 | 5 |
| 22–Jun–94 | 1490751 | 0.213 | 189 | 79 | 14 | 5 |
| 06–Jul–94 | 2935498 | 0.210 | 178 | 73 | 13 | 4 |
| 13–Jul–94 | 1745406 | 0.249 | 201 | 58 | 19 | 8 |
| 19–Jul–94 | 1520397 | 0.253 | 74 | 43 | 7 | 3 |
| 27–Jul–94 | 2301200 | 0.288 | 58 | 54 | 7 | 3 |
| 17–Aug–94 | 5323780 | 0.254 | 156 | 47 | 15 | 6 |
| 24–Aug–94 | 1816700 | 0.260 | 111 | 52 | 11 | 5 |
| 01–Sep–94 | 1911800 | 0.239 | 192 | 27 | 17 | 7 |
| 07–Sep–94 | 1295300 | 0.216 | 240 | 130 | 18 | 6 |
| 14–Sep–94 | 1358000 | 0.194 | 320 | 44 | 21 | 7 |
| AVERAGE | 1937288.02 | 0.250 | 185 | 60 | 17 | 7 |

## $BOD_5$ LOAD ON STATE WATERS

Projected concentration in aeration pond effluent = 17 mg/l

Projected concentration in storage pond effluent = 7 mg/l

Assume concentration of $BOD_5$ in leakage is an average of the aeration pond effluent and the storage pond effluent:

$$\textit{Concentration of leakage} = \frac{17+7}{2} = 12\ mg/l$$

Projected annual flow = 0.250 MGD x 365 = 91.25 MGY

Irrigation Capacity:

| | | |
|---|---|---|
| Golf Course Pumps ≈ | 43.2 MGY | |
| New Irrigation Pump ≈ | 17.3 MGY | |
| | 60.5 MGY | Irrigation Capacity |

Leakage = 91.25 - 60.5 = 30.75 MGY

$BOD_5$ load = (30.75 MG)(12 mg/l)(8.34) = 3,077 pounds $BOD_5$

BIG SKY AERATION REQUIREMENTS MODIFIED IAWP

Influent $BOD_5$ Load = 297 mg/l
Circular WQB - requires 2.5 lbs. $O_2$/lb. $BOD_5$ removed
Use EPA partial mix model to estimate lbs. $BOD_5$ removed in first cell.

$$Ce = \frac{Co}{1 + kpmt}$$

Where,

Ce = $BOD_5$ Concentration in effluent of 1st aeration cell
Co = 297 mg/l
kpm = reaction rate coefficient
= 0.138 $d^{-1}$ (typical winter rate)
t = detention time
= $\frac{8.2 \text{ MG}}{2 \text{ (0.261 MGD)}}$
= 15.7 days

$$Ce = \frac{297}{1 + 0.138\ (15.7)} = 93.8 \text{ mg/l}$$

lbs $BOD_5$ removed = (297-93.7) (8.34) (0.261)
= 442 lbs/day

lbs $O_2$ required = 442 lbs/day x 2.5 $O_2$/lb $BOD_5$
= 1,106 lbs $O_2$/day
= 46 lbs $O_2$/hr.

HP required at AOR of 1.51 lbs $02/_{HP\text{-}Hr}$

$$HP = \frac{46 \text{ lbs } O_2/\text{hr}}{1.51 \text{ lbs } O_2/\text{hp.hr}}$$

= 30.46 HP

Use 6-5HP aerators in first cell

Second Aerator Cell

Influent $BOD_5$ = 93.7 mg/l

$$Ce = \frac{93.7}{1+0.138\ (15.7)}$$

= 29.6 mg/l

lbs. $BOD_5$ removed = (93.7 - 29.6) (8.34) (0.261 MGD)
= 139.5 lbs $BOD_5$/day

lbs $O_2$ required = (139.5) (2.5 lb $O_2$/lb $BOD_5$)
= 348.8 lbs. $O_2$/day
= 14.5 lbs $O_2$/hr.

$$\text{HP required} = \frac{14.5 \text{ lbs } O_2/\text{hr}}{1.51 \text{ lbs } O_2/\text{HP.Hr}} = 9.62$$

Use Two 5 HP aerators

FIELD OXYGEN TRANSFER RATE

(T-20)

$$AOR = \frac{SOR \times alpha \times [(Csw \times beta) - Cr] \times 1.024}{9.17}$$

Where,

SOR = Standard Oxygen Transfer Rate at standard conditons.
= 3.0 lbs. O2/HP-HOUR

T = Temperature of Wastewater at Design Conditions
= 12.0 Degrees Centigrade

Csw = Saturation concentration at Design Temperature and 6,178 ft. Elevation
= 10.83(11.7/14.7)
= 8.62

beta = Saturation correction coefficient
= 0.95

alpha = O2 Transfer rate correction coefficient
= 0.9

Cr = Residual dissolved O2 concentration to be maintained.
= 2.0 mg/l

AOR = 1.51 LBS O2/HP-HR

# APPENDIX B

# SCOPE OF WORK
# WSD 363 SEWER REPAIR

1. Slipline 16" I.D. A.C. line from MH 297 to MH 298, 325 feet

2. Install new manhole metering station at the end of Low Dog Road including new concrete vault, excavation, road realignment, and moving building (outhouse size) from Meadow Village to site. Materials and electrical by RID 305.

3. Repair sewer pipe 235 feet up Yellowtail Road from Black Otter Road.

4. Repair infiltration at 44' (pipe crack), 49', 50' (joints) 10" PVC pipe, Mountain Village behind Hill Condos, MH 299 to MH 298

5. Excavate manholes at 6 sites, raise 2' each: MH 295 @ Lake
   MH 296 @ Lake
   MH 297 @ Lake
   MH 139 @ HV
   MH 111 @ Little Coyote
   MH 289 @ L.Dog

6. Excavate manholes at Low dog Road, Two Moons Road, and Black Eagle Road that have been paved over, raise to grade (grade rings)

7. Repair leaking MH 298

8. MH 294 to MH 313, Stillwater Condos, repair broken pipe at 99 feet, crack from 172 to 178 feet, broken from 322 to 324 feet

9. MH 326 to MH 325, Turkey Leg Road, repair broken pipe 340 to 342 feet

10. MH 325 to MH 324, Turkey Leg Road, repair offset joint at 34 feet, broken pipe at 223 to 225 feet

11. Two Moons Road, MH 29 to MH 28, repair broken pipe at 125 to 131 feet

12. Two Moons Road, MH 26 to MH 27, repair offset joint at 56 feet (Repaired 9/30/93)

13. Two Moons Road, MH 27 to MH 28, repair cracked pipe at 211 feet (Repaired 9/30/93)

14. Two Moons Road, MH 21 to MH 20, repair cracked pipe at 10 to 22 feet (Repaired 9/30/93)

15. Two Moons Road, MH 20 to MH 19, repair broken pipe at 102 to 105 feet (Repaired 9/29/93)

16. Uncover and raise to grade MH between MH 49 and MH 13 on Curley Bear Road (Repaired 9/30/93)

17. Spotted Elk Road, MH 32 to MH 33, repair offset joint at 320 and 325 feet (Repaired 9/27/93)

18. Spotted Elk Road, MH 33 to MH 34, repair smashed pipe at 290 feet, offset joint at 395 feet (Repaired 9/27/93)

19. Spotted Elk Road, MH 34 to MH 35, repair cracked and broken joint at 124 feet (Repaired 9/28/93)

20. Spotted Elk Road, MH 35 to MH 36, repair broken pipe at 342 to 345 feet (Repaired 9/27/93)

21. Yellowtail Road, MH 43 to MH 44, repair broken pipe at 167 to 169 feet, 209 to 211 feet, 262 to 265 feet, joint problem at 356 to 359 feet (Repaired 9/23/93)

22. Yellowtail Road, MH 45 to MH 46, repair offset joint at 336 to 343 feet (Repaired 9/22/93)

23. Yellowtail Road, MH 46 to MH 3, repair offset joints at 125 to 130 feet, cracked pipe from 157 to 158 feet, rolled gaskets or joint problems at 202 to 207 feet, terminate service right at 208.5 feet (drain tile), fix joint at 210 feet (Repaired 9/22/93)

ETB 24. Mountain Mall, MH 317 to MH 316, repair broken pipe at 168 to 172 feet and at 370 feet

RID305\WORK.LST

RECEIVED
NOV 22 1994
HKM ASSOCIATES
4M357.102

1. **LOCATION:** BOBTAIL HORSE ROAD
   MH 206 - MH 207
   **PROBLEM:** COLLAPSED PIPE IMPEDING FLOW. SEWAGE BACKED UP INTO MH 207
   **PROBLEM FOUND:** BROKEN PIPE FROM MONTANA POWER CONSTRUCTION AND A JOINT WITHOUT A COLLAR
   **REPAIRS DONE:** REPLACE SECTIONS OF PIPE

2. **LOCATION:** LONE MOUNTAIN GUEST RANCH
   MH 155 - MH 156
   **PROBLEM:** BROKEN AND COMPRESSED PIPE
   **PROBLEM FOUND:** COULD NOT FIND PROBLEM
   **REPAIRS DONE:** NONE

3. **LOCATION:** LONE MOUNTAIN GUEST RANCH
   MH 155
   **PROBLEM:** LEAKING MANHOLE
   **PROBLEM FOUND:** LEAKING MANHOLE DUE TO HIGH GROUNDWATER TABLE
   **REPAIRS DONE:** REPLACE TAR AROUND THE MANHOLE RINGS AND GROUT LEAKING JOINTS IN THE BOTTOM OF THE CONE. DRAIN WATER AWAY FROM THE MANHOLE

4. **LOCATION:** LONE MOUNTAIN GUEST RANCH
   MH 154 - MH 153
   **PROBLEM:** BROKEN AND MISSING PIPE
   **PROBLEM FOUND:** HOLES IN PIPE DUE TO IMPROPER BACKFILLING
   **REPAIRS DONE:** REPLACE SECTIONS OF PIPE

5. **LOCATION:** CROW KING ROAD
   MH 166 - MH 165
   **PROBLEM:** OFFSET JOINT
   **PROBLEM FOUND:** OFFSET JOINT AND BROKEN PIPE
   **REPAIRS DONE:** REPLACE SECTION OF PIPE AND FLUSH DEBRIS FROM LINE

6. **LOCATION:** RAIN IN FACE ROAD
   MH 212 - MH 208
   **PROBLEM:** CRACKED AC PIPE THROUGHOUT LINE WITH ROOT INTRUSION AND INFILTRATION
   **PROBLEM FOUND:** CRACKED PIPE AND OFFSET JOINTS
   **REPAIRS DONE:** REPLACE SECTIONS OF THE LINE WITH 8" PVC ( 160' OF NEW PIPE INSTALLED )

7. **LOCATION:** CHIEF JOSEPH
   MH 161 - MH 110
   **PROBLEM:** OFFSET JOINT AND BROKEN PIPE
   **PROBLEM FOUND:** OFFSET JOINT AND HOLE IN PIPE
   **REPAIRS DONE:** REPLACE SECTION OF PIPE

8. **LOCATION:** LONE WALKER ROAD
   MH 57 - MH 56
   **PROBLEM:** PLUGGED LINE BACKING WASTEWATER INTO MANHOLES
   **PROBLEM FOUND:** PLUGGED LINE
   **REPAIRS DONE:** PUMP WATER AND FLUSH DEBRIS FROM LINE

9. **LOCATION:** WHITE OTTER ROAD
   MH 335
   **PROBLEM:** HOLES IN CONCRETE COLLAR
   **PROBLEM FOUND:** HOLES IN CONCRETE COLLAR
   **REPAIRS DONE:** GROUT AND SEAL HOLES

| | | |
|---|---|---|
| 10 | LOCATION: | BLACK EAGLE ROAD |
| | | MH 312 - MH 312A |
| | PROBLEM: | HOLE IN TOP OF PIPE |
| | PROBLEM FOUND: | LARGE HOLE IN TOP OF PIPE DUE TO EXCAVATION BY THREE RIVERS PHONE COMPANY |
| | REPAIRS DONE: | REPLACE SECTION OF PIPE AND LOCATE AND EXPOSE UPPER MANHOLES |
| 11 | LOCATION: | CHIEF JOSEPH ROAD |
| | | MH 180 - MH 179 |
| | PROBLEM: | DEBRIS IN LINE |
| | PROBLEM FOUND: | DEBRIS IN LINE IMPEDING FLOW |
| | REPAIRS DONE: | CLEAN DEBRIS FROM LINE AND REPLACE CRACKED AC PIPE |
| 12 | LOCATION: | BOBTAIL HORSE ROAD |
| | | MH 205 - MH 204 |
| | PROBLEM: | CRACKED AND PULLED JOINTS |
| | PROBLEM FOUND: | CRACKED AND PULLED JOIN WITH SOIL AND ROOT INTRUSIONS |
| | REPAIRS DONE: | REPLACE SECTIONS OF PIPE |
| 13 | LOCATION: | BOBTAIL HORSE ROAD |
| | | MH 206 - MH 205 |
| | PROBLEM: | HOLE IN PIPE |
| | PROBLEM FOUND: | HOLE IN PIPE |
| | REPAIRS DONE: | REPLACE SECTION OF PIPE |
| 14 | LOCATION: | LONE WALKER ROAD |
| | PROBLEM: | SEWER BACKING UP |
| | PROBLEM FOUND: | GRADE NOT STEEP ENOUGH TO CARRY FLOW CORRECTLY |
| | REPAIRS DONE: | LOCATE MAN HOLE 58 AND RAISE. FLUSH DEBRIS FROM LINE |
| 15 | LOCATION: | LONE MOUNTAIN GUEST RANCH |
| | | MH 160 - MH 159 |
| | PROBLEM: | INDENTED AND CRACKED PIPE |
| | PROBLEM FOUND: | INDENTED AND CRACKED PIPE |
| | REPAIRS DONE: | REPLACE SECTION OF LINE. LOCATE MH 160 AND FLUSH DEBRIS FROM LINE |
| 16 | LOCATION: | RAIN IN FACE ROAD |
| | | MH 198 - MH 197 |
| | PROBLEM: | CRACKED PIPE |
| | PROBLEM FOUND: | CRACKED PIPE |
| | REPAIRS DONE: | REPLACE SECTION OF PIPE |
| 17 | LOCATION: | LONE MOUNTAIN GUEST RANCH |
| | | MH 159 - MH 158 |
| | PROBLEM: | CRUSHED PIPE |
| | PROBLEM FOUND: | CRUSHED AND CRACKED PIPE |
| | REPAIRS DONE: | REPLACE SECTION OF PIPE |
| 18 | LOCATION: | LONE MOUNTAIN GUEST RANCH |
| | | MH 158 - MH 157 |
| | PROBLEM: | OFFSET JOINT |
| | PROBLEM FOUND: | PIPE CURVES UNDER A CONCRETE PAD USED TO STABLE HORSES |
| | REPAIRS DONE: | NONE |

| | | |
|---|---|---|
| 19 | LOCATION: | LONE WALKER ROAD |
| | | MH 58 - MH 57 |
| | PROBLEM: | WASTE WATER BACKING UP INTO MH 58 |
| | PROBLEM FOUND: | PROBABLE LOW AREA IN THE LINE |
| | REPAIRS DONE: | FLUSH THE LINE |
| 20 | LOCATION: | LONE MOUNTAIN GUEST RANCH |
| | | MH 157 - MH 156 |
| | PROBLEM: | COMPRESSED PIPE |
| | PROBLEM FOUND: | COMPRESSED PIPE |
| | REPAIRS DONE: | REPLACE SECTION OF PIPE |

# SCOPE OF FUTURE WORK
# WSD 363 SEWER REPAIR

1. Black Eagle Road, MH 312B to MH 312C, repair wide joint
2. Black Eagle Road, MH 312 to MH 312A, repair broken joint ← completed
3. Black Eagle Road, MH 291A to MH 291, repair cracked and smashed pipe
4. Sitting Bull Road, MH 307 to MH 308, repair broken pipe
5. Sitting Bull Road, MH 307 to MH 306, repair leaking service connection, MH 307 repair leaking manhole
6. Sitting Bull Road, MH 304 to MH 305, repair cracked pipe
7. Sitting Bull Road, MH 302 to MH 303, repair cracked and broken pipe
8. Crow King Road, MH 167 to ?, repair broken pipe and wide joint
9. Crow King Road, MH 165 to MH 166, repair wide joint ← completed
10. Crow King Road, MH 165 to MH 162, repair offset joint
11. Crow King Road, MH 164 to MH 163, repair offset joint
12. Pinewood Hills, MH 127 to MH 126, repair broken and cracked pipe
13. Chief Joseph Trail, MH 163 to MH 162, repair broken pipe
14. Chief Joseph Trail, MH 161 to MH 162, repair crushed and broken pipe
15. Chief Joseph Trail, MH 161 to MH 110, repair offset joint ← completed
16. Chief Joseph Trail, MH 183 to MH 182, repair offset joint
17. Chief Joseph Trail, MH 182 to MH 180, repair offset joint
18. Chief Joseph Trail, MH 179 to MH 180, repair broken and plugged line ← completed
19. Off Little Coyote, MH 108 to MH 169, repair offset joint
20. Off Little Coyote, MH 103 to MH 173, repair offset joint

21. Bob Tail Horse, MH 207 to MH 206, repair plugged and broken pipe ← Completed

22. Bob Tail Horse, MH 205 to MH 206, repair offset joint ← Completed

23. Bob Tail Horse, MH 205 to MH 204, repair wide joint ← Completed

24. Rain in Face, MH 200 to MH 199, repair wide joint

25. Rain in Face, MH 196 to MH 197, repair broken joint ← Completed

26. Rain in Face, MH 189 to MH 190, repair offset joint

27. Rain in Face, MH 189 to MH 188, repair broken pipe

28. Rain in Face, MH 186 to MH 185, repair broken pipe

29. Rain in Face, MH 187 to MH 188, repair cracked pipe

30. Two Gun White Calf, MH 190 to MH 191, repair wide joint

31. Two Gun White Calf, MH 214 to MH 213, repair offset joint

32. Two Gun White Calf, MH 227 to MH 228, repair offset joint

33. Two Gun White Calf, MH 218 to MH 217, repair broken pipe

34. Two Gun White Calf, MH 218 to MH 217, repair broken pipe

35. Two Gun White Calf, MH 216 to MH 217, repair offset joint

36. Two Gun White Calf, MH 216 to MH 215, repair offset joint

37. Two Gun White Calf, MH 215 to MH 213, repair offset joint

38. Two Gun White Calf, MH 213 to MH 212, repair infiltration at joint

39. Two Gun White Calf, MH 212 to MH 208, repair infiltration at joint and offset joint

40. Two Gun White Calf, MH 208 to MH 88, repair offset joint

41. Two Gun White Calf, MH 227 to MH 228, repair offset joint and infiltration at joint

42. Two Gun White Calf, MH 223 to MH 86, repair offset joint

43. Dull Knife, MH 222 to MH 221, repair offset joint

44. Dull Knife, MH 221 to MH 219, repair offset joint

45. Crazy Horse, MH 219 to MH 220, repair offset joint

46. Lone Mountain Ranch, MH 159 to MH 160, repair broken pipe ← Completed

47. Lone Mountain Ranch, MH 159 to MH 158, repair crushed pipe ← Completed

48. Lone Mountain Ranch, MH 158 to MH 157, repair crushed pipe
49. Lone Mountain Ranch, MH 156 to MH 157, repair offset joint
50. Lone Mountain Ranch, MH 156 to MH 155, repair hole in pipe, infiltration and infiltration in manholes
51. Lone Mountain Ranch, MH 155 to MH 154, repair crushed pipe
52. Lone Mountain Ranch, MH 153 to MH 154, repair broken pipe

Completed

RID305\FUTWORK.LST

# APPENDIX C

**BIG SKY COUNTY WATER & SEWER DISTRICT # 36**
P. O. BOX 160670
BIG SKY, MT. 59716
PH. 406-995-2660 FAX 406-995-4899

BIG SKY, MONTANA OCTOBER 5, 1994

Big Sky, over the years, has become an important asset to all of us. The activities, lifestyle and the simple pleasure of one of nature's most beautiful places is important to anyone living, or visiting here. You can help preserve Big Sky's clean and natural environment by practicing something most of us are already aware of; **HOUSEHOLD WATER CONSERVATION.**

By now you have heard of the complicated wastewater treatment problems facing Big Sky. The solution to such a complex problem often takes on many different aspects, some large some small, yet each, in its own way, benefits the solution.

**HOW CAN YOU CAN BE PART OF THE SOLUTION?????** It is as simple as **replacing** your old (post 1980) bathroom showerheads with a high efficiency water-saver showerhead ! * Did you know that replacing a conventional showerhead ( 3.5 gallons per minute) with a 2.5 gallons per minute fixture could result in an annual household savings of 4.3 gallons per person per day ? The typical 2.2 person household (average for Big Sky) would save between 9.53 and 17.93 gallons per day or 3,478 to 6,544 gallons of water per year. Not much you say !!! Well, multiply that by the approximately 900 homes served by the Big Sky District. That means your District will treat and additional 5,889,600 gallons of wastewater annually or, if the total average occupancy is around 75% the total additional would still amount to 4,417,200 gallons. Not such a small item, now that it has been put into perceptive, is it ?

*Source: *Water Efficiency*, published by the Rocky Mountain Institute, 1739 Snowmass Creek Road, Snowmass, Colorado 81654,revised Nov.1991

Its so simple, yet it can have such a large impact. You can change out that old showerhead,or you can call your management company or even your plumber to do it for you. Don't wait, participate in keeping Big sky one of the truly great places.

**PARTICIPATE, BE A PART OF THE SOLUTION**

**SAMPLE NOTICE**

# NOTICE:

# PLEASE HELP CONSERVE WATER

BIG SKY IS CURRENTLY IN THE PROCESS OF UPGRADING AND EXPANDING THE WASTEWATER TREATMENT FACILITY FOR THE COMMUNITY. UNTIL THE FACILITY IS COMPLETE, WE ASK YOUR HELP IN REDUCING FLOWS AT THE WASTEWATER PLANT BY REDUCING WATER USE WHENEVER POSSIBLE.

# APPENDIX D

ORDINANCE NO. 94-1001

**AN ORDINANCE LIMITING THE USE OF INDIVIDUAL WASTEWATER TREATMENT SYSTEMS AND ESTABLISHING REQUIREMENTS FOR CONNECTION TO THE PUBLIC WASTE WATER TREATMENT SYSTEM OPERATED AND MAINTAINED BY THE BIG SKY COUNTY WATER AND SEWER DISTRICT #363.**

## PREAMBLE

1. The Big Sky County Water and Sewer District #363 ("sewer district") was formed to protect the public health and to operate, maintain and upgrade the public wastewater treatment system ("public system") for the Big Sky area.

2. The use of the public wastewater treatment system is crucial for the protection of ground water and surface water quality and for the protection of the public health.

**BE IT ORDAINED by the Board of Directors of the Big Sky County Water and Sewer District #363 as follows:**

1. Definitions. For the purposes of this ordinance, the following definitions apply:

   (a) "Person" means any individual, corporation, partnership, firm, company, association, or other organized group;

   (b) "Permit" means a sanitary connection permit issued by the sewer district;

   (c) "Individual waste water treatment system" means any privy, privy vault, septic tank, drain field, cesspool, or other individual facility for the treatment or disposal of waste water;

   (d) "District manager" means the person employed by the district to oversee the operation and maintenance of the public system.

   (e) "District Board" means the Board of Directors of the Big Sky County Water and Sewer District #363.

2. Connection to the public system. The owner of any residence, commercial establishment, public institution, or any other structure within the sewer district requiring the disposal of wastewater shall, at his own expense, properly connect to the public system.

3. **Permit.** No person may connect to the public system without first obtaining a written permit from the sewer district.

4. **Application for a permit.** Any person who wishes to obtain a permit must submit an application on forms provided by the sewer district. The application shall be in writing, shall be signed and verified by the owner of the property which is to be connected to the sewer system, and shall contain the following:

(a) the name and address of the owner;

(b) the legal description of the parcel which is to be connected to the public system;

(c) the size, type, and proposed use of the building which the owner intends to construct to connect to the public system;

(d) the load anticipated to be placed on the public system by the proposed use of the building, including when appropriate;

(i) when the building is residential, the number of anticipated residents; or

(ii) for all other uses, the anticipated load shall be listed in anticipated total gallons or liters of sewage flow.

5. **Individual waste water treatment systems.**

(a) A person may not construct or maintain any individual waste water treatment system within the boundaries of the sewer district after the date of enactment of this ordinance, except as provided in subsection (b) of this section.

(b) If a sewer main for the public system does not pass within 500 feet of a person's property line, a person may install an individual waste water treatment system, provided that:

(i) any individual waste water treatment system that is installed pursuant to this section must comply with all applicable state regulations and county ordinances and must be properly permitted by county officials; and

(ii) any person with an individual waste water treatment system must connect to the public system within 180 days after a main for the pubic system is constructed within 500 feet of the person's property line, or within 180 days after an easement across intervening property is secured.

6. <u>Variance for Hardship</u>.

(a) A person may obtain a variance from the prohibition against the construction of an individual wastewater treatment system as described in sections 2 and 5 of this ordinance by submitting an application to the district manager, on forms provided by the sewer district, requesting a variance from the provisions of sections 2 and 4 and a showing that compliance with those provisions will impose a hardship.

(b) In order to establish a hardship justifying a variance under this section, the applicant must show that:

(i) the hardship is unique and peculiar to the applicant's land and is different from any hardship that the ordinance may impose on all properties in the district;

(ii) the hardship is caused by conditions beyond the applicant's control;

(iii) the failure to grant the variance will result in a loss to the applicant of virtually all value for any of the uses to which the property could reasonably be put; and

(iv) the granting of the variance will not violate the spirit of this ordinance and will not jeopardize the goals of water quality protection embodied in the ordinance.

(c) Economic hardship is characterized by a decrease in property value or other financial loss will not, of itself, constitute hardship for the purpose of securing a variance under this section;

(d) The district manager must present the variance request and his recommendation to the district board at its next regularly scheduled meeting after receiving a complete application for variance.

(e) The district board must either approve or deny the variance application within 45 days of receiving the recommendation of the district manager.

7. <u>Change of use</u>. Any person who proposes to change his current property use so as to increase the amount of contribution to the public system must submit an application to the district manager on forms provided by the sewer district and receive his approval from the district manager before changing the use of his property.

8. **Denial of permits.** The district manager may deny a permit for connection to the public system or an application for change of use if:

(a) the applicant's proposed connection fails to comply with state law and regulations;

(b) the public system has reached its capacity for the treatment and disposal of sewage; or

(c) a state, federal, or local order specifically precludes the connection of additional service to the public system.

9. **Appeals.** If the district manager denies a permit application or a change of use application, the applicant may file an appeal with the district board within 30 days after the denial is issued. The district board must act upon the appeal within 45 days of receiving it.

10. **Penalty.** Any person violating any provision of this ordinance shall be guilty of a misdemeanor and shall be subject to a criminal penalty of up to six months in jail and a fine of $500.

# DRAFT ORDINANCE NO. 94-1002

**AN ORDINANCE REQUIRING THE INSTALLATION OF WATER CONSERVATION DEVICES ON FAUCETS, SHOWER HEADS, AND TOILETS IN ANY NEW CONSTRUCTION AND IN ANY REMODELING OF BUILDINGS IN SEWER DISTRICT NO. 363.**

**BE IT ORDAINED by the Board of Directors of Sewer District No. 363 as follows:**

1. **Purpose.** The purpose of this ordinance is to implement water conservation performance standards in the construction of new houses requiring plumbing and plumbing fixtures and in the remodeling of existing houses in which plumbing or plumbing fixtures are modified.

2. **Application.** This ordinance applies to all new construction and all remodeling involving the replacement of plumbing fixtures in all residential, hotel, motel, industrial or commercial facilities or in other occupancies which the Board of Directors of Sewer District #363 determines to use significant quantities of water.

3. **Water Efficiency Standards.**
(a) The maximum water use allowed in gallons per flush (gpf) for any of the following water closets installed after the effective date of this ordinance is:

| | | |
|---|---|---|
| (i) | gravity tank-type toilets | 1.6 gbf |
| (ii) | flush-o-meter tank toilets | 1.6 gbf |
| (iii) | electromechanical hydraulic toilets | 1.6 gbf |
| (iv) | blowout toilets | 3.5 gbf |
| (v) | urinal | 1.0 gbf |
| (vi) | gravity tank-type 2-piece toilet which bears the label "commercial use only" | 3.5 gbf |

(b) The maximum water use for showerheads installed after the effective date of this ordinance is 2.5 gallons per minute (gpm) which measures at a flowing water pressure of 80 pounds per square inch.

(c) The maximum water use allowed for any of the following faucets installed after the effective date of this ordinance is:

| | | |
|---|---|---|
| (i) | lavatory faucets | 2.5 gpm |
| (ii) | lavatory replacement aerators | 2.5 gpm |
| (iii) | kitchen faucets | 2.5 gpm |
| (iv) | kitchen replacement aerators | 2.5 gpm |
| (v) | metering faucets | 0.25 gpm |

(d) No urinal or water closet that operates on a continuous flow or continuous flush basis is permitted.

4. **Public restrooms.** Except where designed and installed for use by the physically handicapped, lavatory faucets located in restrooms intended for use by the general public must be equipped with a metering valve designed to close by spring or water pressure when left unattended.

5. **Effective date.** The effective date of this ordnance is _____, 1995.

# APPENDIX E

## LETTERS FROM MAJOR USERS

October 6, 1994

Mr. Chip Hamilton
P.O. Box 160670
Big Sky, MT 59716

Dear Mr. Hamilton,

The Golden Eagle lodge converted its shower heads in all 42 rooms "High Efficiency" or "Low Flow" in the fall of 1993.

We work for several homeowners within the Big Sky Resort and will encourage all of these individual homes and condominiums to switch to "High Efficiency" shower heads. Golden Eagle Management will install the shower heads if the homeowners will invest in the initial purchase.

With any luck we can retrofit most of the units before this upcoming season.

Glad you're in Big Sky Chip, hope to see you soon!

Sincerely,

Tim Ryan

Tim Ryan

golden eagle
p.o. box 160008 • big sky, montana 59716
property management • condominium rentals • economy lodging
800-548-4488 FAX 406-995-2447 406-995-4800

# SEWER DISTRICT #363

PO Box 160057 • Big Sky, Montana 59716 • (406) 995-4166 • FAX: 995-4899

October 5, 1994

Hamlet
Talk to me
Bob

Mr. Bob Schaap
Lone Mountain Ranch
P.O. Box 160069
Big Sky, MT 59716

Dear Bob:

I would like to ask a favor of you, if it is within your province to grant it. Would the Lone Mountain Ranch be willing to install high efficiency showerheads in all of their bath areas?

Big Sky Resort, John Kircher and Golden Eagle Lodge, Tim Ryan, have agreed to convert all of their showers to the 2.5 gallon per minute or less heads by the end of the '94-95 ski season. With your cooperation on this, we could have 100% of the nightly rental businesses within the District comply with the State of Montana's requests on this item.

Thank you, I look forward to hearing from you.

Sincerely,

Z.O. Hamilton, Manager

c.c. Wayne Hill

ZOH/pbp

Chip - We completed this project several years ago. All guest cabins, crew housing & our house have low flow showers heads. What about using resort tax moneys as an incentive to encourage replacement of toilets to low flow models?

Bob

BIG SKY
MONTANA

BIG SKY OF MONTANA
*Ski and Summer Resort*

P.O. Box 160001
Big Sky, Montana
59716

(406) 995-5000
Fax (406) 995-5001

*National Reservations*
(800) 548-4486

*Group/Convention Sales*
(800) 548-4487
Fax (406) 995-5003

BOYNE USA RESORTS
*Big Sky, MT*
*Boyne Mountain, MI*
*Boyne Highlands, MI*
*Brighton, UT*

Mr. Chip Hamilton
Big Sky Water and Sewer District No. 363
P.O. Box 160057
Big Sky, MT 59716

October 4, 1994

Dear Chip:

We at Big Sky of Montana Ski and Summer Resort are aware and concerned about the use of water and its subsequent impact on a waste water treatment facility.

Therefore, as a show of good faith that Boyne is willing to help to this end, we would like to go on record with the water and sewer district as volunteering to retrofit the resort hotel and managed condominiums to meet 1994 standards, in lieu of a published compulsive policy to do so.

We intend to get as much of this accomplished as possible by December 1, 1994 (up to 50%) and have the project 100% completed by the end of the winter season.

Please feel free to call me with any questions you may have regarding this issue.

Sincerely,

JOHN E. KIRCHER
General Manager
Big Sky of Montana

:mbw