

# Big Sky Sustainable Water Solutions Forum Stakeholder Meeting

## Agenda

October 18, 2017

1:00 p.m. – 4:00 p.m.

Big Sky Water and Sewer District Conference Room

561 Coyote Drive

### 1:00 pm. Welcome

- Overview of day
- Objectives:
  - Finalize areas of consensus on activities within focus areas
  - Discuss and work to finalize unresolved areas
  - Discuss how to sustain these activities in implementation

### 1:10: Overview of Activities Identification and Status

- Jeff Dunn, Karen Filipovich

### 1:25: Activities in Focus Areas

- Check in on focus area activities and areas that appear to have consensus.
  - Discuss benefits in proposed actions
  -
- Unresolved Issues: Discuss unresolved issues and reach decision or path for further discussion
  - **Wastewater Reuse and Treatment:** Surface water discharge alternative. Other alternatives may need more discussion as well.
- Focus areas – Identify participation role, timeline, any remaining questions on setting those actions.

### 2:45: Stewardship Plan Implementation: Ensuring Actions are Implemented

- Discuss desired qualities for ongoing commitment, review, adaption, funding, oversight and transparency
- Consider proposed structures
- Identify unanswered questions

### 3:55: Public Comment

### 4:00: Adjourn

## **Big Sky Sustainable Water Solutions Forum Goals and Objectives**

Goals adopted on 3/30/17. Objectives adopted on 6/15/17. Consensus of stakeholder present was achieved.

### **Overall Vision Statement**

Big Sky strives to be a model mountain community by protecting and improving water resources, sustaining ecological health of the watersheds, and supporting a vibrant local economy.

### **Ecological Health of the River Systems**

#### **Goal**

A healthy and resilient river system sustained through a principled approach to watershed stewardship that includes human activities and natural processes that maintain and enhance stream, riparian and wetland conditions and connections, ensuring water remains clean and cold.

#### **Objectives**

- Maximize water quantity, protect existing high quality and improve degraded water quality
- Identify, sustain, and enhance high-value riparian corridors and wetland areas
- Sustaining aquatic communities while enhancing native populations

### **Water Supply and Availability**

#### **Goal**

Manage and balance surface and groundwater supplies for a vibrant community sustaining a broad spectrum of uses and values including fisheries, wildlife, recreation, agriculture, municipal and domestic needs.

#### **Objectives**

- Sustainably manage groundwater and surface water by improved monitoring and forecasting, conservation, and reuse of reclaimed water.
- Maintain sufficient, high quality year-round in-stream flows to meet ecological needs (quality and quantity)
- Increase community resilience to drought and climate variability

### **Wastewater Treatment and Reuse**

#### **Goal**

Develop and implement holistic wastewater and stormwater management, utilizing best available technologies and practices, to meet Big Sky's long-term community needs and protect and improve the ecological health of the river systems.

#### **Objectives**

- Ensure wastewater does not have a negative impact on the ecological health of the river systems and groundwater resources
- Identify alternative strategies for land application of treated wastewater
- Address onsite septic systems

# **Big Sky Sustainable Water Solutions Forum**

## **Identified Activity Priorities**

9/21/17

### **Ecological Health of the River Systems**

- 1) Watershed Status and Trends Monitoring Program
  - 1) Scientifically monitor and track important parameters for ecological health
- 2) Watershed Status and Trends Dashboard
  - 1) Share information with the community and provide a basis for action if some component of the river system is not healthy
- 3) Watershed Restoration and Conservation
  - 1) Address existing water quality impairments
  - 2) Protect the existing high-quality resources

### **Water Supply and Availability**

- 1) Monitoring and Modeling
  - 1) Know what we have for water supply (ground water monitoring, water balance)
  - 2) Protect the Meadow Village aquifer and other locally important aquifers
- 2) Outreach and Incentives for Conservation
  - 1) Maximize use of the limited, valuable water in the system
  - 2) Use conservation easements to reduce supply (also crosses over to priority 3 in ecological health and lowers total projected effluent in wastewater)
- 3) Stormwater
  - 1) “Slow the flow” of water running through the system
- 4) Wastewater reuse
  - 1) Reclaim a valuable resource
- 5) Mitigation

### **Wastewater Treatment and Reuse**

- 1) High treatment levels for treated wastewater
- 2) Address septic systems
- 3) Expand water reuse for irrigation.
- 4) Snowmaking with treated wastewater

# **Big Sky Sustainable Water Solutions Forum Stakeholder Meeting Notes**

**September 21, 2017**

**1:00 p.m. – 4:15 p.m.**

**Big Sky Water and Sewer District Conference Room  
561 Coyote Drive**

**Stakeholders Attending:** Guy Alsentzer, Upper Missouri Waterkeeper; Pat Byorth, Trout Unlimited; Mike Feibig, American Rivers; Susan Duncan, AGAI; Ron Edwards, Big Sky Water and Sewer District; Kristin Gardner, Gallatin River Task Force; Kevin Germain, Lone Mountain Land Company, Matt Kelley, Gallatin City-County Health Department; Lori Christenson, Gallatin City-County Health Department; Peter Manka, Alpine Water; Taylor Middleton, Big Sky Resort; David O’Conner, Buck’s T-4; Mike Richter, MT Bureau of Mines and Geology; Tim Skop, Gallatin County Planning; Tammera Swinney, Gallatin Local Water Quality District; Wendi Urie, Custer-Gallatin National Forest; Brian Wheeler, Big Sky Resort, BSWSD Board; Steve White, Gallatin County; Jessie Wiese Montana Land Reliance; Bob Zimmer, Greater Yellowstone Coalition

**Public Attending:** Emily Casey, Gallatin River Task Force; Amanda Eggert, Explore Big Sky; Rich Addicks, Gallatin River Task Force; Ray Armstrong, DOWL; Scott Buecker, AE2S; Matt Gregg, Grown and Caldwell; Andrea Saari, Gallatin River Task Force; David Wilson, CH2M; Brian Viall, AE2S; Rich McEldowney, Confluence; Stephanie Lynn, Gallatin River Task Force

**Consultants:** Jeff Dunn, RESPEC; Karen Filipovich

## **Detailed Notes**

### **Technical Presentations: Wastewater Treatment and Reuse**

The Big Sky Water and Sewer District is having an engineering analysis completed to look at plant upgrades. While this does not commit the BSWSD to a specific course of action, the results of that analysis give significant information and guidance on feasibility and costs of actions that the biggest treatment and reuse utility in Big Sky can undertake in the next several years. Since plant upgrades have an estimated lifecycle of 20 years, their direction can affect many water users and the potential for options for wastewater treatment and reuse.

In order for the Big Sky Sustainable Water Solutions Forum to better understand what is currently in place and what is possible technologically, representatives from the two finalist firms gave the group a detailed overview.

#### **Ray Armstrong, PE DOWL**

Ray provided an overview of the current big Sky Water and Sewer District plant and issues pertinent to treatment and reuse in the Big Sky area.

Raw effluent from homes and businesses is piped to the treatment plant in the Meadow Village.

There are 2 Sequencing Batch Reactors (SBR) that are biological process that grow bacteria. This process breaks down nitrate and “waste” coming into this process is used as a food source to grow. Ammonia oxidizing bacteria (AOB) and nitrate oxidizing bacteria (NOB) work to break down waste.

Bio-solids from this process are separated and composted through a process that yields Grade A compost (suitable for all applications) that is sold for \$25/yard. This compost process was chosen both to make a valuable product and to avoid trucking bio-solids down the Gallatin Canyon and land applying them as waste.

Tertiary filtration also is used to further treat the wastewater.

Treatment levels for total nitrogen have varied over time. In 2016, after some repaired to some filtration, has 11 mg/l TN. In the years immediately prior, rates had risen, probably because that equipment was not working at full effectiveness. The 2016 rate is similar to the design expectations for the plant.

Treated wastewater is stored in ponds outside the growing season. Storage ponds exist in the Meadow Village, Yellowstone Club and Spanish Peaks that all store water from this treatment plant. Yellowstone Club’s storage pond also holds treated wastewater that is stored in that storage pond.

Currently, all treated wastewater is reused through irrigation. There are some significant limitations to the amount of land that can be used because irrigation should not be applied to any areas with mapped landslides, slopes of over 20-30 degrees. Ray Armstrong showed a map of the Big Sky area that highlighted areas where land application might be suitable. Subsurface disposal is also limited because there are limited areas for drain fields.

The current plant started in 2001 and was one of the first SBR plants in Montana. It’s design life is approximately 20 years.

Newer technologies for centralized treatment plan include Membrane batch reactors (MBR) that can produce treated wastewater with a total nitrogen of about 5 mg/l. This has been used in a few plants in the US and in Europe. [Moonlight is in the process of designing an MBR plant for that system, as Kevin Germain discussed in November 2016]. Other treatment methods include aerobic granular sludge, a process developed by the Dutch government, and BioMag, a process that uses magnetite in a biological floc to provide higher levels of clarification in a treatment system.

Questions and Discussion on Ray Armstrong’s Presentation:

How long are plants generally run? Ron Edwards: Facility Plans generally work within a 20-year planning window and bonds are typically paid in that period too

What is the total projected effluent load for the Big Sky Water and Sewer District? It is about 320 MGY at full build-out. The District is obligated to provide water and sanitation services for all lots that have been platted.

What is the level we could get with “mixed” technologies? About 2 mg/l total nitrogen. This would be considered the limits of technology.

How much of a waste stream needs to go through the limits of technology? Does reuse methods like irrigation vs. snowmaking or direct discharge to streams all need to be at the same level? There was no immediate answer, but the next presentation had some material that suggested higher nutrient levels for irrigation and less use of fertilizer could be useful.

What about pharmaceuticals and such? Micropollutants, personal care products, and endocrine disruptors are all contaminants of emerging concern (CECs) and there is some work on technologies that could filter them

**Scott Buecker, PE; AE2S**

Scott focused on options for what could be done to upgrade the current treatment plant and discussed current limits of technology for wastewater treatment and potential for reuse.

To start, “What’s important to the trout?” In thinking about this, it is useful to split treated wastewater into two streams: one for irrigation where plants want and can uptake nutrients (the diagram presented showed a treatment level of about 7 mg/l total nitrogen) and higher levels of treatment for any water that would go to the river.

Suggestions here included switching to an MBR plan that would treat to about 7 mg/l of total Nitrogen and used for irrigation. Water not intended for irrigation would be further treated, first by using and MBR with gas and then using ozone, activated oxidizing bacteria (AOB) or biological activated carbon (BAC). This would reduce total nitrogen to about 2 mg/l and remove the toughest forms of nitrogen.

A question was asked about what would happen if the higher level of treatment broke down. Scott Buecker said that water could be stored in the storage ponds while any problems were fixed.

Question: Could the fertilizers on the golf course be adjusted? Balancing the nitrogen from the water and from the fertilizer could be a good way to reduce total nitrogen in application methods.

Discussion came up on how technologies and methods may not mesh. Current DEQ criteria for the plant water treatment and storage was also cited as an issue for using some technologies together – chlorine is added to treated water, but would not mix well with floating islands in the storage ponds. If a system is approved without Chlorine, then floating islands could be a possibility.

Contaminants of Emerging Concern were also discussed. An MBR plan along will not remove them, according to a study of methods. However, Advance oxidation processes (Granular activated carbon (GAC) and ADP) can remove 90-99% of these types of contaminants/

Reverse osmosis takes out salts and is expensive to get rive of and energy intensive to use. This is not a technology that he’s recommend for this area of the country. In coastal areas, getting rid of the saline by-product is usually accomplished by putting it in the ocean.

Questions:

Both engineers were asked if they'd drink the wastewater produced from one of the advanced plants. Both said yes without any hesitation.

A question was asked on current nitrogen and phosphorus levels in the Gallatin now. Kristin Gardner said it is about .1 mg/l of total nitrogen and had negligible phosphorus.

What is the limits of technology for end of the pipe wastewater treatment? It is about 2 mg/l of total nitrogen and .05 mg/l of total phosphorus.

What about cooling methods ensuring treated wastewater is cool? In a pipeline, it can cool with winter air. Currently is about 6 degrees C out of BSWSD. Temperature goes down to about 1-degree C in the winter on the Gallatin.

How much volume would be wastewater to the receiving river, if discharged? It would depend on which stream (West Fork vs. Gallatin), but it would be a very small amount of the total volume of water in the Gallatin.

Are there other considerations related to discharge? It could not be an obstruction and would have to be impervious to ice flows.

In the plant, the goal is to optimize the environment for the bacteria we want. A new approach is "granular activated sludge."

## **Community Survey: Preliminary Update on Responses**

The community survey on the Water Forum's priorities and input was still open. However, 134 surveys had been collected and preliminary analysis has been conducted. A full summary of the results will be out in October after the survey is closed.

The survey was distributed via email to stakeholders, on listservs and to people identified as interested parties from previous meetings or contacts, and the Gallatin River Task Force website. Stakeholders also distributed it in a number of different ways ranging from email forwarding to newsletter and blog articles. Several community meetings were also held (and continue to be held) and attendees were encouraged to answer the survey.

Big Sky part or full-time residents made up about 42% of respondents. Gallatin Valley residents made up a little over 50% of respondents, with the balance from the Madison Valley and other areas. Big Sky residents were asked to fill in more detail about where they lived. A high number identified specific subdivisions. The largest single group of responses were from residents from the Meadow Village.

All respondents were asked to identify where their water came from and where their wastewater effluent was treated. It does appear that the vast majority of respondents did know the answers to these questions. This questions also suggests that respondents to this survey had a better than average understanding of basic water infrastructure.

Respondents were also asked to identify activities they did in or near water in the Big Sky area. The focus was on summer season activities. Hiking/biking was by far the most popular activity, followed by fishing, boating, living by water, working near water, golfing and several write-in activities including camping and various forms of skiing.

The next set of questions asked respondents to rate the importance of priorities that the Water Forum had agreed upon as preliminary priorities. In every case, priorities stated were identified as “very important” more often than any response. This suggests that the Water Forum stakeholders have identified priorities that are attuned to the interests of residents of Big Sky and downstream.

There were many comments submitted that will require further grouping and analysis once the survey is closed. As a preliminary statement, the majority of comments were aimed at affirming a particular priority or offering specific information or thoughts on a strategy to pursue to fulfill those priorities. There were several comments that identified specific actions the respondent did or did not want related to wastewater reuse. No direct discharge to surface water did appear in several comments related to this issue. There were also a number of comments that were factually incorrect in some way, suggesting that more education and outreach will be needed to help educate the community on the intricate nature of water resources management in Big Sky.

## **Review of Priorities**

Jeff Dunn briefly recapped the priorities that the group discussed and came to consensus on in June.

### **Ecological Health of the River Systems**

#### ***Priorities***

- 1) Watershed Status and Trends Monitoring Program
  - 1) Scientifically monitor and track important parameters for ecological health
- 2) Watershed Status and Trends Dashboard
  - 1) Share information with the community and provide a basis for action if some component of the river system is not healthy
- 3) Watershed Restoration and Conservation
  - 1) Address existing water quality impairments
  - 2) Protect the existing high-quality resources

### **Water Supply and Availability**

#### ***Priorities***

- 1) Monitoring and Modeling
  - 1) Know what we have for water supply
  - 2) Protect the Meadow Village aquifer and other locally important aquifers
- 2) Outreach and Incentives for Conservation
  - 1) Maximize use of the limited, valuable water in the system
- 3) Stormwater
  - 1) “Slow the flow” of water running through the system
- 4) Wastewater reuse

- 1) Reclaim a valuable resource
- 5) Mitigation

Specific actions have been identified for these priority areas, and those were outlined in a handout that was included in the materials packet for this group. All stakeholders and community members are asked to identify areas where they can take action, since that will be the question for the next two months.

Participants were asked to point out any actions that were not already in the actions outlined. These were identified:

- Add water budget to water supply under priority 1
- Want more discussion of wastewater as part of potable water supply
- Dashboard – recap the report card.
- Discuss mitigation opportunities in conjunction with thinking about turning fully consumptive actions into less consumptive ones. Also, would this have an effect on recharge rates in ground water?

### **Wastewater Treatment and Reuse**

The group is not as far along in this area. This is the main topic for further discussion today. It is clear that three major priority areas have been identified:

- No negative impact to the ecological health of the river systems
- Identify alternatives to the current system of wastewater reuse land application
- Address septic system impacts

Jeff showed the projected need for wastewater treatment and reuse by 2035. That total is estimated at about 570 million gallons of wastewater generated per year, roughly double to current amounts. Several scenarios were shown to start the conversation about what participants would like to see for priorities.

## **Wastewater Treatment and Reuse Focus Area Discussion**

Wastewater is treated and reused in a number of different ways in Big Sky, ranging from the centralized advanced treatment plants at the Big Sky Water and Sewer District, Yellowstone Club, and Moonlight to around 1,000 individual septic systems along the Gallatin and in other areas of the Big Sky.

### **Treatment Levels of Treated Wastewater:**

The engineers had discussed in some depth the potential for wastewater treatment, so discussion began here, following in the line of extensive discussion during the spring.

Many participants had observed that higher treatment levels offer more opportunities to reuse treated wastewater in ways that are beneficial.

As a point of information, the water quality standards for streams in the area was reviewed. For B-1 streams, Montana water quality standards state that total nitrogen should not be higher than 3 mg/l and no more than .3 Mg/L of phosphorus. These standards only apply during the growing season from

July 1-September 30. The limits of technology treatment levels discussed in the engineering presentations were lower than these standards, but streams do have ambient levels of nutrients before such a treated flow could be added. If this treated wastewater was directly discharged to the river, it would likely need a mixing zone before it would meet ambient standards during the growing season.

Points of discussion included:

- Treat water to an extremely high standard
- How many times can this treated water be recycled?
- If surface water discharge was sought, what would be considerations to ensure there was no ecological impact?
  - Can't be a dead zone for fish and aquatic life
  - Can't be a barrier to trout in terms of migration or habitat
  - Note that there is a big difference between discharge during spring runoff and low waters in August
    - Likely negligible effect during runoff
    - Highly treated and cooled water could be a benefit in August
    - Ambient conditions vary by season [note: an earlier presentation noted that ambient conditions can vary by time of day in this system]
- Would like to see all reuse options used prior to discharge
- Treatment levels for centralized plants, including the Big Sky Water and Sewer District plant currently in operation are much higher than any septic or onsite system.
  - Level 1 septic systems are at 40-60 mg/l of total Nitrogen for septic systems. Current level 2 systems are about half that – 20-40 mg/L total nitrogen. In 2016, the BSWSD was about 11 mg/l of total nitrogen, and the new ideas presented could bring that down substantially.
  - This gap between treatment technologies may promote a strong push to bring septic and small onsite systems online
  - Alternately, it could be that converting to level 2 systems would be a start.
  - Ron Edwards pointed out that if a pipe was extended to the turnoff from the current treatment plant, a second pipe that could eventually be used to pump effluent up from homes and businesses along the Gallatin could be installed at the same time at far less cost than one dug later.

## **Alternatives to Existing Options for Reuse**

Currently, all treated wastewater is reused in one of two ways: it is stored and then irrigated on golf course or dedicated forest land or it is percolated through soil before reentering the water system, typically into ground water. The centralized plants of BSWSD, Yellowstone Club, Moonlight and Buck's T-4 system all use irrigation for their reuse method. All septic and community systems using onsite technologies reused it in the second method.

### **Addressing Septic on Onsite Systems:**

- Given the relatively high nutrient loading from septic systems, there is substantial interest in finding ways to reduce those nutrient loads.
- However, Canyon area residents and businesses offer little feedback on their desired options
- Septic and onsite systems are essentially multiple discharge points. Engaging more community members on this effort is a needed step.
- Appear to be two potential methods of addressing septic:
  - Improving on what exists (maintenance and upgrades)
  - Centralize

#### Centralization:

- Centralizing to a central plant could mean expanding the current utility and treating in the Meadow or forming a second public system for a designated area.
- Zoning densities and the projections for a total effluent if fully built out are a concern in terms of handling wastewater
- Incentive approaches:
  - Something like, “If you want to build, then vote for centralized sewer” in order to ameliorate impact of further development.

#### Septic and Onsite Systems:

- Level 2 systems take a lot more maintenance than Level 1 systems. If they are not maintained, they are no better than Level 1 systems.
- Septage a real concern with septic systems. Right now, BSWSD takes a small amount of septage, but most is trucked down the Gallatin corridor and land applied on fields near Manhattan, and even further afield in Broadwater County as Gallatin County runs out of suitable space. The current design of the BSWSD plant is one in which septic solids are composted and sold, rather than land applied.
- Subsidize local service providers
- Septic receiving stations a possibility, but challenging for centralized wastewater treatment plant operators:
  - Think stations need to be a requirement on plants (currently voluntary and BSWSD has one.)
  - Operators fear the unknown – oil, grease, other problems entering the system and fouling it up.
- Septage in Forest Service toilets in area also very difficult to get rid of and must be hauled down canyon. It would be useful to include addressing this in the design of the upgraded wastewater treatment plant so it does not need to be hauled.
- Education, infrastructure, policies.
  - Septic homeowner’s need education
  - Gallatin Health and Gallatin Local Water Quality District are working to institute require education for septic owners acquiring a permit.
  - It could be instituted by Gallatin County.
  - Don’t need to renew permits once issued, so wouldn’t be an ongoing contact.

- Education to help homeowner to understand and respect their responsibilities in and to the community that includes things like proper maintenance (GRTF Septic Smart; Code of the West approaches suggested)
- May want to think harder about tools that ensure that 100% build-out of canyon zoning doesn't occur.
  - Transfer of development rights
  - Retiring land from development through conservation easements
  - Cost could be a real factor in doing this effectively
  - Changes in existing zoning are changing an entitlement that has already been granted and likely to be politically difficult. It would be easier to assign those rights somewhere else.

Proposals were asked for how to best address decentralized systems in the Big Sky area. Is a phased approach being suggested?

- Have to have some planning for the decentralized systems or we've "only patched half the net"
- Actions in the short term:
  - Education
  - Analysis of impacts (Canyon aquifer GW study, further monitoring in mainstem, where centralized system might be most cost-effective and technically feasible)
  - Maintenance of existing systems
- Start identifying:
  - Where to push upgrades to level 2 systems, since they have about a 30-year lifespan (which cost 20-30K, more for larger community or business onsite systems).
  - What timeframe is feasible for centralized systems? Where is going to be feasible/not feasible?
    - It's important to focus dispersed infrastructure improvements to areas where centralization is less likely and focus on
  - Centralization may have two physical phases:
    - Phase 1: get a pipe to the corner of 191 and 64
    - Phase 2: expand further upstream and downstream
- Addressing septic and onsite systems is clearly complicated. What would be important in implementing a strategy?
  - Maintaining communication among partners
  - These are some of the busiest people in the county, so need a commitment to work through this
  - Engage more septic and onsite system owners in canyon and outlying areas
  - Issue for county, so may be some opportunities there

## Pros and Cons of Reuse Options

The group then turned its attention to addressing the third priority for wastewater in identifying alternatives options for wastewater reuse from centralized treatments. By 2035, projections for future capacity for sanitation and reuse are around 570 million gallons annually from all types of infrastructure. Capacity using current methods and areas is limited.

### Irrigation Reuse:

Summer irrigation is currently 7-8 times winter use in the Big Sky Water and Sewer District, the only entity that has monitored these differences to this level. Using treated wastewater in the place of direct ground water pumping could save precious water supply.

- Purple pipe has been seen as a way to extend reused water irrigation. The Town Center has open tracts that would be extended, and has already put some pipes in for future use. Lots along the golf course would also be areas that would be easy to extend, if all landowners agreed to the extensions. One barrier to implementing this approach is that people would need to agree to use the water, since the community would be relying on it as part of its reuse strategy.
- It might be easier to change behavior through water pricing to stop new water irrigation and move toward purple pipe networks delivering reused water
- We can track changes in use by looking at differences between summer and winter use
- Need to make sure areas aren't over-irrigated
- Need guidelines to ensure fully consumptive
- Cost: benefit analysis to find the areas that are most feasible to extend purple pipe to.
- Would we get a break-down of water storage capacity and use by month – in January? In March? Timing will be important for this approach
  - For BSWSD, water may be out right now in September, though this year, there is significant water available for reuse
  - Right before growing season is the likeliest highest storage month (April/May)
  - Storage pond capacity does have some space left – the new Spanish Peaks pond getting 14-15 million gallons this fall, and the Yellowstone Club pond has some storage capacity.
- How easy would it be to pump wastewater up from the Canyon? Answer: Pumps and pipes are the easy part.
- We'd need to think about water rights implications of expansion, since this reuse option is completely consumptive.
- A benefit of reusing treated wastewater is that it cuts supply demand and leaves water in the ground. The current system of golf course irrigation means that 100 MGY of ground water is not pumped for that use.
- Is there an explanation for you the uptake on the Yellowstone Club and (forthcoming) Spanish Peaks golf course is roughly 5x less than that at the Big Sky Resort? Growth season, soil and irrigation of a smaller area were indicated as answers.
- Soil uptake is a part of irrigation reuse

## **Snowmaking:**

### Potential and Treatment:

- Snowmaking is all about the level of treatment, DEQ permits and how the community will embrace this approach.
- Big Sky Resort currently uses about 100 MGY to make snow, using ground water resources. Taylor Middleton said they might be able to use 300 MGY for snowmaking. The reason is climate change. The recent climate assessment reported a 3-degree F rise in temperature in the last 20 years. A total of 6-degree F rise in temperature is projected in the next 25 years. Skiing is the essence of the economy.
- Regarding treatment, if engineers are willing to drink the highly treated wastewater, snow would be good for kids to play in.
- Think we need to treat to limits of technology. A discharge permit of some kind will be needed.

### Permitting and Regulatory Considerations:

- Is this form of snowmaking allowed? Not now. For DEQ, making snow = surface discharge
- The difference is that snow puts it back in the watershed more slowly, while surface water discharge from a pipe delivers it immediately downstream.
- What about mitigation?
- Yes, snowmaking would physically mitigate, not legally.
- What would need to happen to have snowmaking work from a regulatory perspective?
- DEQ considers level of treatment
- Regulatory changes would be needed, but we need more information how any changes would occur. Would it be regulatory? Legislative? If we can show ecological benefits, would be helpful
- Public perception will be important. We need YouTube videos of people drinking the treated wastewater.
- Constructed wetlands might be a treatment or catchment in some places
- Facilities not currently equipped to deal with ground water infiltration

### Seasonality and Storage:

- Would snowmaking extend past October and November? Could it expand into January-March?
- Currently, most snowmaking is in November and December.
- Would we have timing issues with storage then, since ponds are emptiest at the end of the growing season?
- Storage of water is going to be an issue. Need some kind of auxiliary/emergency storage
- Yellowstone Club has a pond designed that could hold about 50 MGY above the existing pond; it could be add some needed redundancy in system
- When does BSWSD plan to reline storage ponds (Ron replied, "Next manager," so a while)
- Runoff timing is still going to be controlled by weather
- Snowmaking at higher altitudes may be key. Snowmaking in the bowl, upper Mr. K, north slopes could move final melt as late as July. Participants like this idea, suggesting that it could be a "glacier" in the bowl, could even be deliberately covered or otherwise stored into early summer, and agriculture would like it even later, if possible

## Perception and Public Relations

- Public relations with resort guests for the next 50 years is a factor. We need to think about the next 50 years and making sure that this method won't bring up bad PR, compared to 100% recycling on golf courses
- PR is easier with snowmaking [than some other options] because everyone can benefit
- This is going to require long lead times and a significant education component
- Golf courses all over have embraced reuses for years. The ski industry can manage this transition too.
- Agriculture users will be fine if water is treated to high levels and if we don't have to worry about contaminants of emerging concern.

## Timeline Issues:

- Right now, snowmaking isn't a tool in the box ready to go. We're going to need to forge the tool.
- From a timeline perspective, this won't be an option that is implemented immediately. Short-term activities are going to need to include short-term analysis

## Benefits:

- Snowmaking has potential as "money in the bank" and there is high value in storing water in snow for slower movement of water through Big Sky and downstream – helps time water to when it is needed

Karen Filipovich said it appeared there were consensus on four points and asked participants to weigh in on them:

1. Treat wastewater to high levels
2. Address septic and onsite systems
3. Reuse – expand as much as possible
4. Snowmaking with treated wastewater

Everyone voted that they were enthusiastic or could live with these options.

Three other options the group has discussed have not achieved consensus:

1. Direct surface water discharge to streams
2. Ground water discharge
3. Constructed wetlands

An observation made was that more analysis on amount addressed and potential benefits is needed.

## **Cutting Total Effluent**

In addition to reusing treated wastewater, stakeholders also discussed that several measures that have been discussed in other focus areas also could be used to cut the future effluent curve. These strategies should also be thought of in terms of their role in minimizing the total projected effluent, as well as their other benefits in the areas of water supply and availability and the ecological health of the river systems.

- Community or private decisions that result in less than 100% build-out. Conservation easements like the Whitefish purchase in Haskill Basin could be used strategically in Big Sky to voluntarily limit future development, with benefits including limiting total effluent, limited stress on water supply, and conserving valuable habitat, riparian areas and wetlands.
- Water conservation has the direct effect of limiting effluent.

**Public Comment**

No public comment was offered at this time.

The meeting was adjourned at 4:15.

Name and Organization: \_\_\_\_\_

**Actions:** Check those you and your organization can help with in implementing.

**Ecological Health of the River Systems**

Actions to Accomplish Monitoring Priorities	Lead Partner	Participant in Specific Activities	Funding (direct or support)	Progress review
1) Initially focus on tributary streams most affected by development and changes to the aquifer, along with the Gallatin River mainstem.				
2) Expand existing water quality monitoring to fill data gaps.				
1) Expanded water quality monitoring network and additional parameters to better understand nutrient and sediment dynamics				
2) Expanded streamflow and water temperature monitoring network				
3) Wetland and riparian assessments and hydrologic connectivity				
4) Fish population monitoring and instream habitat assessments				

**Details on actions you think your organization and/or community can do:**

**Additional resources and partners to further this area:**

**Additional Actions:**

**Benefits of Successful Actions in this Area:**

Name and Organization: \_\_\_\_\_

**Actions:** Check those you and your organization can help with in implementing.

**Ecological Health of the River Systems**

<b>Actions to Accomplish Dashboard Priorities</b>	<b>Lead Partner</b>	<b>Participant in Specific Activities</b>	<b>Funding (direct or support)</b>	<b>Progress review</b>
1) Develop electronic and physical dashboard to convey environmental information				
2) Develop scientifically based “trigger” levels for dashboard parameters that are specific and relevant to the Big Sky area				
3) Inform stakeholders responsible for managing water resources so that timely and appropriate water management decisions can be made				

**Details on actions you think your organization and/or community can do:**

**Additional resources and partners to further this area:**

**Additional Actions:**

**Benefits of Successful Actions in this Area:**

Name and Organization: \_\_\_\_\_

**Actions:** Check those you and your organization can help with in implementing.

**Ecological Health of the River Systems**

<b>Actions to Accomplish Conservation and Restoration Priorities</b>	<b>Lead Partner</b>	<b>Participant in Specific Activities</b>	<b>Funding (direct or support)</b>	<b>Progress review</b>
1) Identify specific restoration projects to address sources of impairments on TMDL streams				
2) Determine existing conditions in unassessed streams				
3) Identify wetland and riparian areas and stream reaches for restoration and conservation				
4) Maintain wild trout populations and expand native Westslope cutthroat trout populations				

**Details on actions you think your organization and/or community can do:**

**Additional resources and partners to further this area:**

**Additional Actions:**

**Benefits of Successful Actions in this Area:**

Name and Organization: \_\_\_\_\_

**Actions:** Check those you and your organization can help with in implementing.

**Water Supply and Availability**

Actions to Accomplish Monitoring and Modeling	A lead Partner	Participant in Specific Activities	Funding (direct or support)	Progress review
1) Protect the Meadow Village aquifer and other locally important aquifers				
1) Develop groundwater model for Meadow Aquifer				
2) Develop groundwater model for Canyon Aquifer				
3) Develop database of well water quality				
2) Identify groundwater and surface water interactions				
1) Real-time data on groundwater and surface water				
3) Expand monitoring well network and develop real-time reporting of groundwater well levels				

**Details on actions you think your organization and/or community can do:**

**Additional resources and partners to further this area:**

**Additional Actions:**

**Benefits of Successful Actions in this Area:**

Name and Organization: \_\_\_\_\_

**Actions:** Check those you and your organization can help with in implementing.

**Water Supply and Availability**

Actions to Accomplish Outreach and Incentives for Conservation	A lead Partner	Participant in Specific Activities	Funding (direct or support)	Progress review
1) Water metering, tiered pricing, and rebate programs to create incentive based rewards program for "smart" water use				
2) Development of a single "Trout Friendly", "Trout Certified" or "Big Sky Green Certified" logo				
3) Development of design requirements for landscaping to reduce summer irrigation demands				
1) Work with HOA's				
4) Development of a Drought Management Plan				

**Details on actions you think your organization and/or community can do:**

**Additional resources and partners to further this area:**

**Additional Actions:**

**Benefits of Successful Actions in this Area:**

Name and Organization: \_\_\_\_\_

**Actions:** Check those you and your organization can help with in implementing.

**Water Supply and Availability**

Actions to Accomplish Stormwater Management	A lead Partner	Participant in Specific Activities	Funding (direct or support)	Progress review
1) Implement "Slow the Flow" stormwater management				
1) Map stormwater outfall locations				
2) Increase enforcement of construction stormwater regulations				
1) Address both the construction phase of a home and the residential phase				
2) Explore MS4 designation				
3) Minimize traction sand inputs				
4) Install bioswales, rain gardens, and permeable pavement				
1) Increase rain water capture				

**Details on actions you think your organization and/or community can do:**

**Additional resources and partners to further this area:**

**Additional Actions:**

**Benefits of Successful Actions in this Area:**

Name and Organization: \_\_\_\_\_

**Actions:** Check those you and your organization can help with in implementing.

**Water Supply and Availability**

Actions to Accomplish Wastewater Reuse	A lead Partner	Participant in Specific Activities	Funding (direct or support)	Progress review
1) Continue golf course irrigation with reclaimed water in a way that doesn't impact the river				
1) How ensure water is fully consumptive?				
2) Expand irrigation to residential areas and business complexes by expanding the purple pipe network				
1) How ensure water is fully consumptive?				
3) Utilize reclaimed water for snowmaking at area ski resorts				
4) Reuse "grey water" from baths, showers, sinks, dish washers and washing machines within residential and commercial buildings				
5) Develop wastewater treatment wetlands				

**Details on actions you think your organization and/or community can do:**

**Additional resources and partners to further this area:**

**Additional Actions:**

**Benefits of Successful Actions in this Area:**

Name and Organization: \_\_\_\_\_

**Actions:** Check those you and your organization can help with in implementing.

**Water Supply and Availability**

Actions to Accomplish Mitigation	A lead Partner	Participant in Specific Activities	Funding (direct or support)	Progress review
1) Some avenues for further investigation include:				
1) Turn some of the fully consumed water rights to less consumptive (e.g. snowmaking to increase future rights)				
2) Return underutilized water rights				
3) Use non-perfected water rights				
4) Use mitigation for future water rights				

**Details on actions you think your organization and/or community can do:**

**Additional resources and partners to further this area:**

**Additional Actions:**

**Benefits of Successful Actions in this Area:**

**Name and Organization:** \_\_\_\_\_

**Actions:** Check those you and your organization can help with in implementing.

**Wastewater Treatment and Reuse**

<b>Priorities to Accomplish Wastewater Reuse and Treatment Activities</b>	<b>A lead Partner</b>	<b>Participant in Specific Activities</b>	<b>Funding (direct or support)</b>	<b>Engagement and Information Sharing</b>
1) Treat wastewater to high level				
2) Address septic and online systems				
3) Expand irrigation reusing treated wastewater				
4) Snowmaking with treated wastewater				

**Details on actions you think your organization and/or community can do:**

**Additional resources and partners to further this area:**

**Additional Actions:**

**Benefits of Successful Actions in this Area:**