

## Chapter 8: Water and Sewer

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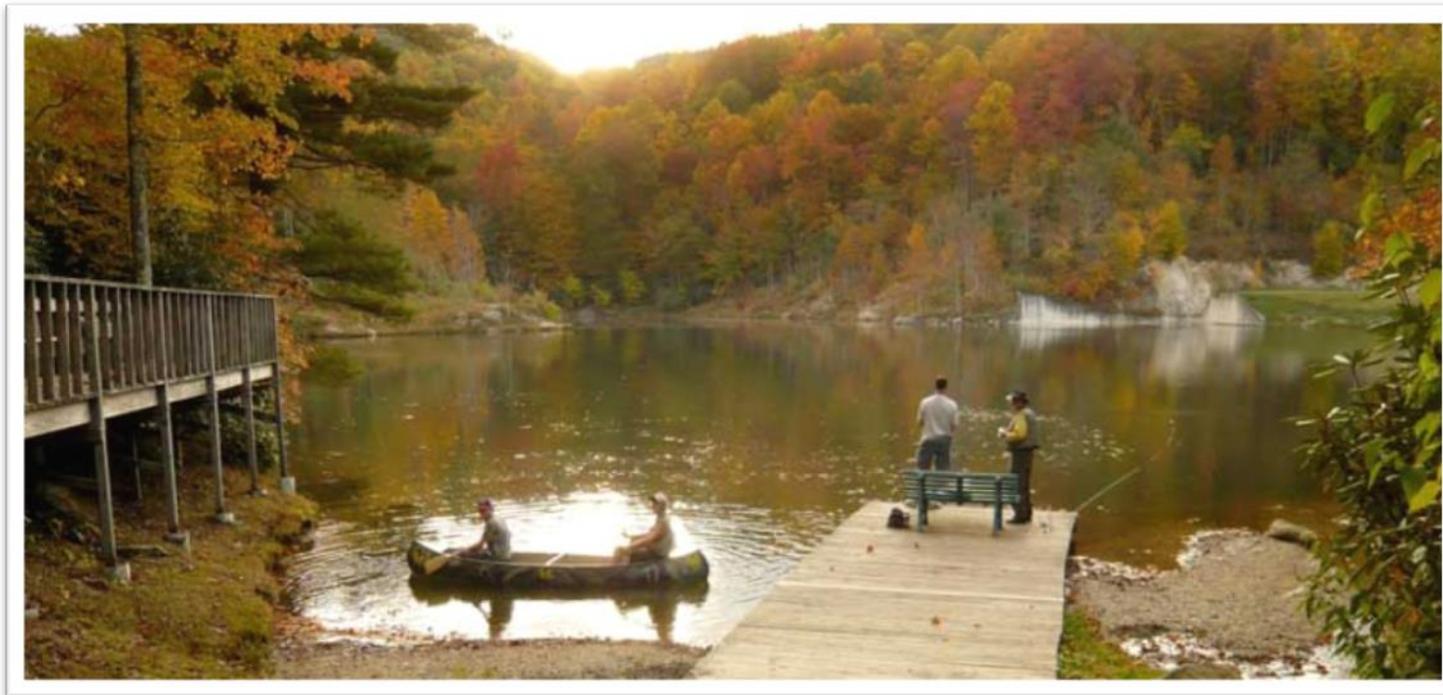
WS: Discussion and Conclusion



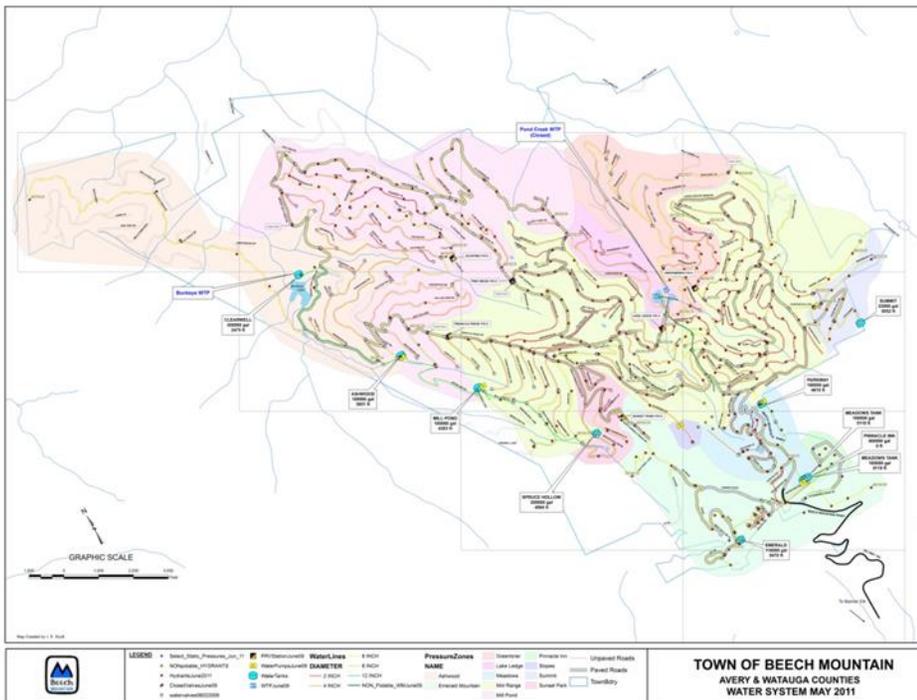
## Background

It has been said that water will be the oil of the next century. Like oil, the availability of clean, potable water is finite, and our growing population will stretch the available sources to their maximum capacity. However, unlike oil, water is an essential, indispensable element of human existence for which we cannot find a substitute. It is no exaggeration to say that without a functional water and sewer system, the Town of Beech Mountain would cease to exist. Our utilities systems, so easily taken for granted, are what have made the idea of a thriving town atop one of North Carolina's highest mountains a reality as opposed to an impossible dream.

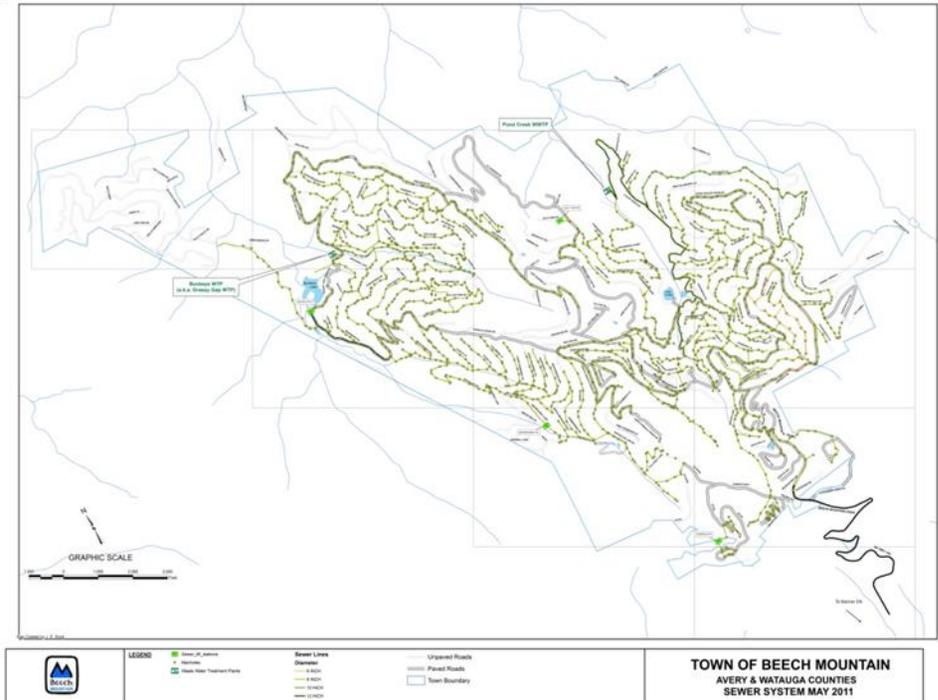
The continued modernization and improvement of our water system is therefore clearly one of the Town's highest priorities for the future and is a fundamental building block without which no other element of this plan has meaning. However, the engineering analysis and calculations required to recommend specific actions necessary and procedures to follow is beyond the scope of this plan. This work has been performed in the existing Beech Mountain Water and Sewer Study prepared by Rothrock Engineering in 2011 and earlier studies. The purpose of this section of the plan, therefore, is not to supersede or supplant any of that analysis, but rather to incorporate that study's goals and findings into a more general document, comprehensible by the layperson. It is also to look at the water and sewer system and the specific projects recommended by the engineering study from a planning perspective – to focus on specific projects and future plans



# Beech Mountain Water and Sewer Systems



Water System



Sewer System

## System Statistics

- 68.5 MILES OF WATER LINE/55.16 MILES OF SEWER LINE
- 361 HYDRANTS
- 9 WATER TANKS
- ESTIMATED 500+ VALVES
- APPROXIMATELY 1700 MANHOLES
- 6 MAJOR WATER PUMP STATIONS/4 SEWER LIFT STATIONS/5 PRESSURE REDUCING STATIONS



## Water and Sewer: Goals, Objectives & Recommended Strategies and Policies

### Goal WS1: Adequate Water and Sewer Capacity for our Town's Future

Buckeye Lake Reservoir has three levels of water intakes, at 6 ½ feet, 13 ½ feet, and 23 ½ feet below full pond. During a moderate drought in the Summer of 2010, water level at its lowest was a mere 18" above the bottom intake. This amounted to a water supply reserve of less than 20 days at the current rates of withdrawal. This experience made obvious the peril that a similar or worse drought could impose, especially when considered in light of potential increases in demand in coming years. It is clear that action is needed to ensure that both our water and sewer systems have the capacity to meet the demands that future growth will place upon them.

The Town's goals in the area of providing for these basic necessities are simple and straightforward:

- To provide Capacity for water and sewer that will be adequate for our Town's future,
- To ensure that the quality of these resources is high, and
- To ensure that these resources are provided with the highest level of efficiency possible.

### Policy WS.G1.P1: Promote conservation of Water Resources

An effective way to ensure that our water and sewer capacities are adequate is to conserve and be more judicious in our use of resources.

#### ***Continue and strengthen our mandatory conservation measures during drought***

Better education regarding conservation practices, better dissemination of conservation requirements, and better enforcement of requirements are three ways to help the system be more effective.

#### ***Billing structure***

Ensure that the Town's billing structure remains organized in such a way that conservation is rewarded, and overuse is penalized.

#### ***Other conservation methods***

The town could also take measures to encourage environmental conservation practices. We can promote and encourage the use of water conservation technology such as rain barrels, low flush volume toilets, and low volume shower heads. To encourage the use of these items during construction, the Town could leverage building permit fee reductions.



**Policy WS.G1.P2: Replace undersized waterlines**

The adequacy of water issue can also be approached from a fire fighting and public safety context. The town has several areas where the primary water lines are 2 inches in diameter. Modern practices no longer use 2-inch water pipe for utility applications because they generally do not provide ideal flow rates for firefighting.

As the town pursues strategies of replacing its water lines these lines should receive weighted priority.

**Policy WS.G1.P3: Continue Focus on Expanding Capacity of Water and Sewer Treatment Plants**

Finally, expanding the capacity of our water and sewer treatment facilities will be a major step towards ensuring our services are adequate to meet needs.

A June 2009 study predicted that the water plant's demand would exceed capacity in 2012. While that has not yet occurred, it is still clear that additional capacity must be developed. As the Town develops and grows, it is clear that they must move ahead with preparation and planning to increase plant capacity in some manner.

Likewise, the Grassy Gap Waste Water Treatment Plant will exceed its useful life expectancy in 2024 and when replaced should be sized to meet future demand.



## Goal WS.G2: Superior Water Quality

It is the goal of the town to provide water that is as pristine as our mountain surroundings.

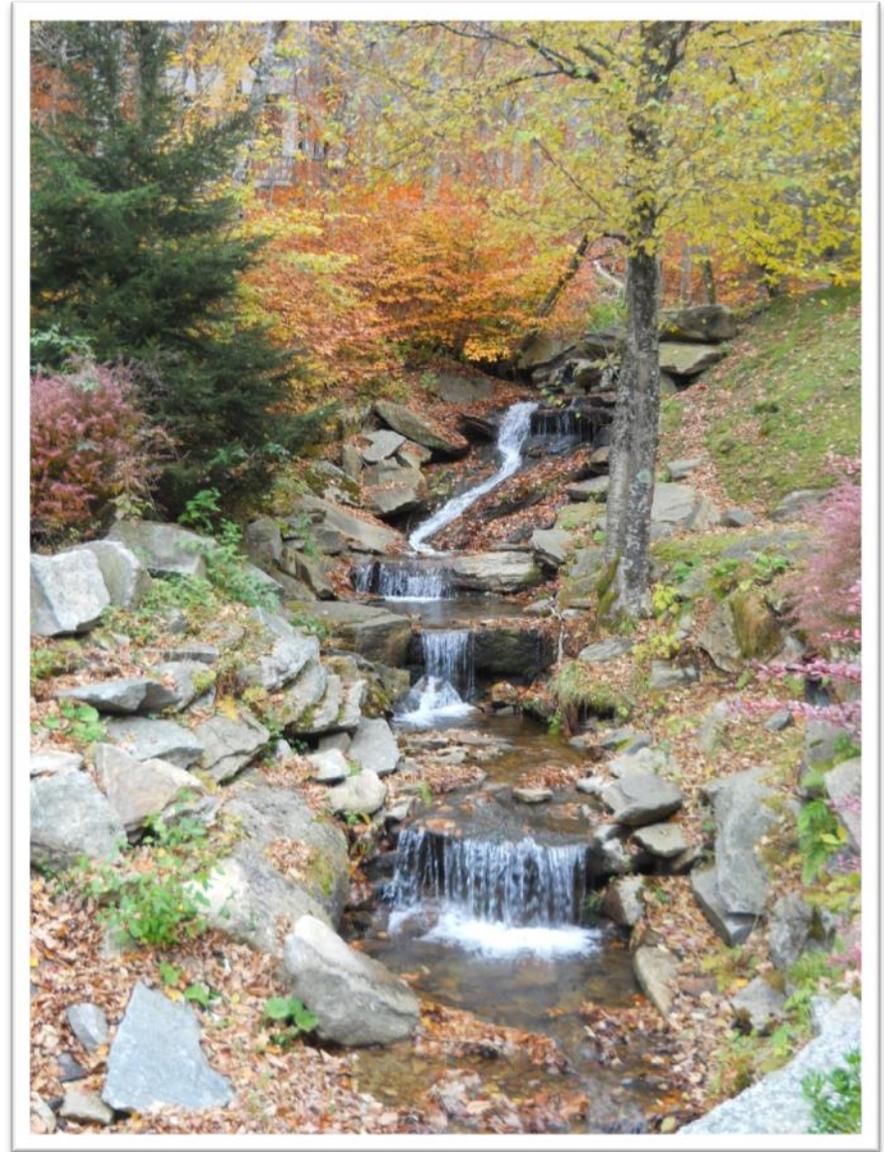
### Policy WS.G2.P1: Protect the Town's watersheds and watercourses

One of the best ways to maintain the town's exceptional water quality is to protect and improve the quality of the water before it even enters the system. This method requires the least amount of construction and infrastructure costs and also benefits wildlife and the environment.

One method of protecting our streams and lakes is through enforcement of the town's watershed protection program as mandated by the North Carolina Department of Environment and Natural Resources. Under this program, there are various watershed classifications within the Town, and sets of rules apply to each based upon the proximity to the reservoir.

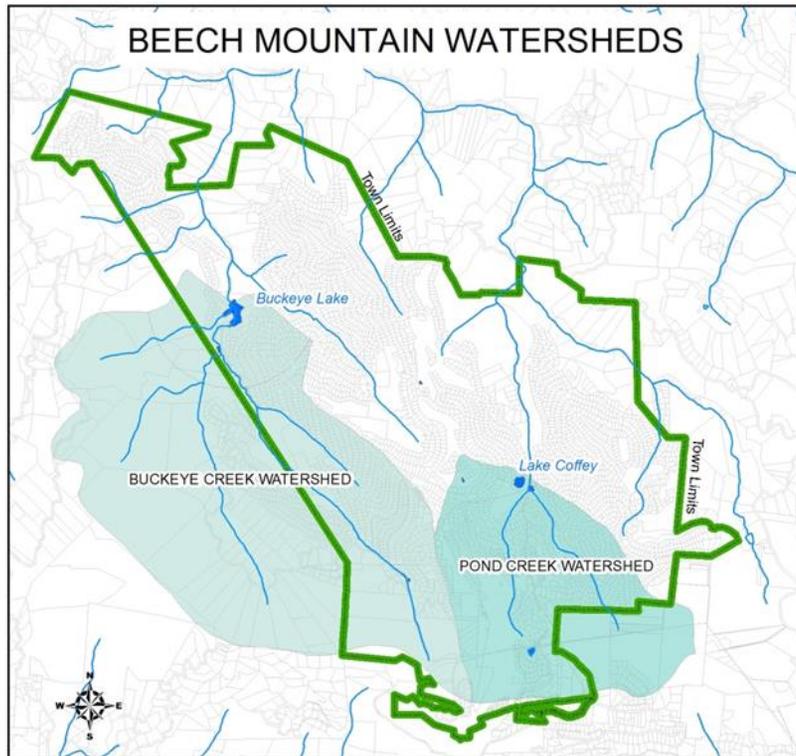
Within the Watershed Overlay Districts, land use is intended to remain undeveloped. Single Family uses are intended to be limited to one per acre (in the WS-II districts) and one per two acres (in the WS-II C district). All other uses are to be limited to a maximum of 6%- 12% built upon area.

Although at first glance this program seems highly restrictive, there is one large exception that makes it have relatively low impact within Beech Mountain's town limits. This exception is that platted lots existing at the time of the enactment of the watershed laws (1993) are exempt from the regulations if used for single family purposes. Almost all of the area within the Town of Beech Mountain that lies in a watershed district was divided into platted lots prior to 1993 and is zoned for single family usage. However, a large percentage of the watersheds lie outside the town's jurisdiction, and these areas contain the largest amount



developable land to which the Watershed Act's regulations would apply. Although these areas are not within the town's regulatory purview, the Town should be vigilant to ensure that standards are upheld in these outlying areas that directly affect the Town's water source.

Another benefit of the watershed rules to the town is that they also grant the town the more general power to prohibit any activities, situations, or structures that pose a threat to water quality, such as inadequate on-site sewage systems or improper disposal of garbage or junk.



The town also enforces state laws regarding setbacks and buffers from streams. Currently our ordinances specify that, "no new development activities may occur within 30' of a perennial watercourse indicated on the most recent versions of USGS 1:24,000 (7.5 minute) scale topographic maps or as determined by Town of Beech Mountain studies." There are actually few "perennial" watercourses within the town, because at our high elevation we are at the source waters for streams, and our watercourses tend to have flows that are often seasonal or intermittent. Beech Mountain should, as the ordinance stipulates, undertake our own studies to determine more accurately which streams actually do make a large influence on our water quality and need to be protected.

A final way of protecting our water sources is to identify areas of significant erosion or other pollution and to undertake streambank or shoreline stabilization and restoration. The town should conduct studies to determine if there are any areas here that would benefit from these processes.

**Policy WS.G2.P2:** Where feasible, the Town should utilize Best Management Practices (BMP's) to better manage Stormwater. One of the most significant sources of pollution in water sources comes directly from the stormwater that washes into them from our streets, parking lots, and other impervious surfaces.

In 2007 the town received a Clean Water Management Trust Fund grant to perform a stormwater inventory and basin study for the town. The study did not extend to the entire town but was confined to a specific identified target area with known stormwater issues.



Products of the study included a GIS database of stormwater data and recommendations to retrofit several sites with Best Management Practices. The study recognized that in improved stormwater management there was potential to significantly enhance the water quality of our streams.

It is recommended that future work expand the scope of this study to include more of the Town. It is also recommended that the town seek sources of funding to implement some of the study's other recommendations, including upsizing several conveyances and culverts, and possibly constructing a stormwater wetland.

**Policy WS.G2.P3:** Systematically and incrementally work toward the replacement of the town's entire water line and sewer line infrastructure.

It is difficult to get clean water out of a rusty, dirty old pipe. Our aging network of water and sewer lines bring problems with efficiency and quality as well as the issues with water leakage and flow rate mentioned above. It should be a long-term goal of the town to work toward the eventual replacement of all of the water and sewer pipes in our system. This far reaching goal should be approached piece by piece, little by little, in a systematic fashion wherein the situations identified as worst are replaced first. The Rothrock study laid out the steps to take in this regard.

### Goal WS.G3: Efficiency in the Delivery of Services

The Town not only needs to provide utility services of adequate quantity and high quality, but it needs to do so in a manner that is economically efficient.

**Policy WS.G3.P1:** Continue to work towards reducing non-revenue water

Non-revenue water (NRW) is water that is produced at the water plant but is not "accounted for" in the utility billing. This NRW is derived from a number of sources, including: inaccuracies in metering, system loss, leakage, billing adjustments, as well as other sources.

The Rothrock Water and Sewer Study revealed a staggering amount of water unaccounted for in the Beech Mountain Utilities System. In 2010, the Town treated 119,663,000 gallons of water, but only billed for 39,631,000 gallons. That means roughly 67% of the water that was pumped into our system was unaccounted for. Addressing this issue has been a priority for the Town over the past several years, which has resulted in significant reduction of NRW.

The study found that the unaccounted-for water is mostly the result of *systematic* leaks that exist system wide. In other words, this is not a matter of simply locating and fixing a few major leaks, but rather it is the result of the accumulation of hundreds or even thousands of small leaks throughout the entire system. The water system is becoming quite aged- being originally constructed in the 1960s- and it is estimated that at least some leakage is present at nearly every tap and coupling.

It was also estimated that one of the largest sources of this problem was not actually water loss at all, but rather inaccurate or non-functioning water meters. The town has already taken a major step towards correcting this by undertaking a major project of replacing every meter in the



town with new “radio read” meters in 2011. Early results have shown a significantly improved accountability for water use and a reduction in work-hours required for meter reading.

#### Policy WS.G3.P2: Reduce amount of Inflow and Infiltration

Mirroring the problem of unaccounted- for water, *inflow and infiltration* are major obstacles to our sewer system being able to handle and process the amount of sewage it receives. Inflow and infiltration is the problem of water seepage into the sewer system, increasing the volume of water that must be treated at the town’s plants.

Many manholes inspected during the water and sewer study showed severe disrepair and age, while it was evident that many others were of substandard construction in the first place. Many manholes had gaping holes in their sidewalls or were lacking any semblance of a seal at the connection between the manhole and the pipe entrance.

The town needs to continue with plans to incrementally replace the sewer lines and manholes system-wide, beginning with those in the worst condition or in the areas with the most severe problems.

#### Policy WS.G3.P3: Capitalize upon GIS technology to efficiently manage Town infrastructure

Geographic Information Systems (GIS) are a technology that allows for the mapping and analysis of Geographic Information. In a GIS, attributes about data can be stored in databases that accompany the spatially mapped feature. This allows GIS to be used as a functional and complete record keeping system for system infrastructure. But much more than just a computer map or a digital record keeping system, GIS also enables that data to be robustly analyzed by considering its spatial characteristics and other attributes. GIS can answer questions like “Where are the oldest sections of pipe?”, “What structures are currently located within 50’ of Buckeye Creek?” or “What manholes are located in the TR-280 Sewer Basin?”. It also allows data of various themes to be layered upon each other to make more complicated analysis.

The benefits of GIS are tremendous. It enables easy access to information on the town’s water and sewer assets, that in turn allow us to make better decisions regarding the maintenance and improvement of the system. It enables efficient delivery of utility services by helping the town determine where to focus its efforts.

Beech Mountain originally had a GIS system developed by a consultant engineering firm in 2001, but without a staff member who knew how to operate and update the GIS, and without anyone who was familiar with how to use its data, the system was not kept up to date. In 2011, the Town took a major step towards keeping its system accurate by purchasing a sub-meter Global Positioning System (GPS) to utilize for collecting data.

Beech Mountain recognizes the potential of its GIS. The town needs to ensure that qualified personnel are retained that understand how to use the technology and that can explain it to others. Furthermore, the data in the GIS needs to be better disseminated among various entities who need to know about our utilities systems, such as the staff of various departments and the towns governing decision makers.



**Policy WS.G3.P4:** Continue to utilize effective long-term budgeting tools to prepare for the costs of necessary improvements to the utility system

To undertake the major infrastructure improvements that our system needs will be expensive. The town will continue to prepare and adhere to multiple year financing tools such as Capital Improvement Plans to accurately forecast and prepare for future expenditures.

**Strategy WS.G3.P4.S1:** Continue to focus on projects in the 5-year Capital Improvements Plan

The Capital Improvements Plan should guide capital improvement projects throughout the course of the period of the plan. Although there will certainly be projects that come up from time to time, it is important that the CIP be a guiding document for project planning and implementation.

## Discussion and Conclusion

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It will be no small matter to ensure that our water and sewer infrastructure is sufficient for our town's future, but the undertaking is essential to the success of the town. The town has received a number of excellent guidelines and recommendations for improvement of the water and sewer systems provided through various technical engineering studies. The town should continue to follow the recommendations of the study, especially those deemed of critical importance.

