

**TOWN OF BLOWING ROCK
NORTH CAROLINA**

**2006 WATER AND SEWER
CAPITAL IMPROVEMENTS PLAN**



Engineering • Planning • Finance
1236 19th Street Lane NW
Hickory, North Carolina 28601

JANUARY 2006

RESOLUTION NO. 2006-01

**RESOLUTION TO ADOPT THE TOWN OF BLOWING ROCK
2006 WATER & SEWER CAPITAL IMPROVEMENTS PLAN**

WHEREAS, a water and sewer capital improvements plan is a policy document created to assist in guiding decisions concerning the short-range and long-range planning of future water and sewer capital expenditures in Blowing Rock; and

WHEREAS, a water and sewer capital improvements plan is used as a comprehensive guide for policy decisions, and serves as a means to identify, prioritize, and plan for water and sewer capital improvements; and

WHEREAS, the Board of Commissioners, Town Staff and water and sewer engineering consultants have worked to develop a comprehensive plan to address - raw water source, water treatment plant, water distribution system, wastewater collection system and wastewater plant - needs over the next 10 years, and to establish an implementation plan.

NOW, THEREFORE, BE IT RESOLVED by the Board of Commissioners of the Town of Blowing Rock, North Carolina, that the 2006 Water & Sewer Capital Improvements Plan is hereby adopted by this Resolution.

Adopted this the 14TH day of February, 2006.

ATTEST:


Sharon Greene, Town Clerk


J.B. Lawrence, Mayor

**2006 WATER AND SEWER
CAPITAL IMPROVEMENTS PLAN**

**TOWN OF BLOWING ROCK
NORTH CAROLINA**

DOUGLAS CHAPMAN, P.E.



Engineering • Planning • Finance
1236 19th Street Lane NW
Hickory, North Carolina 28601

JANUARY 2006

04924



TABLE OF CONTENTS

SECTION I	INTRODUCTION.....	2
SECTION II	RECOMMENDED IMPROVEMENTS	4
SECTION III	SUMMARY AND CONCLUSION.....	20

TABLES

TABLE 1	WATER TREATMENT PLANT PROJECTS
TABLE 2	WATER DISTRIBUTION SYSTEM PROJECTS
TABLE 3	WASTEWATER COLLECTION SYSTEM PROJECTS
TABLE 4	COLLECTION SYSTEM EXTENSION PROJECTS
TABLE 5	WASTEWATER TREATMENT PLANT PROJECTS
TABLE 6	SUMMARY OF CIP PROJECTS AND PROGRAMS
TABLE 7	10-YEAR SCHEDULE FOR CAPITAL IMPROVEMENTS PLAN

SECTION I

INTRODUCTION

A Capital Improvements Plan (CIP) is a plan and schedule of anticipated and required capital expenditures for public utility facilities with descriptions of project needs, estimated project costs, and timing of work over a planning period. Thus, a CIP is an important planning tool that allows a public utility to prepare for upcoming projects and to proactively determine how and when to fund them. The Town of Blowing Rock has contracted with McGill Associates to prepare a CIP to identify needed water- and sewer-related projects, develop probable cost estimates, and prioritize the order and timing in which they should be completed.

The Town of Blowing Rock, which is located in Watauga and Caldwell Counties, owns and operates its water and wastewater systems. The water treatment plant (WTP) has a rated plant capacity of 2.0 million gallons per day (MGD). Due to recent droughts, the Town initiated, at the NCDENR Public Water Supply Section's urging, an instream water supply study to determine the true capacity of the Town's reservoir on Flattop Branch. The raw water source was subsequently rated at a safe-yield withdrawal of 0.4 MGD, 0.25 MGD less than the current average day demand. Consequently, the Public Water Supply Section has placed Blowing Rock under a moratorium which restricts the Town from installing new waterlines to expand their customer base. Though temporary facilities have been put in place to utilize Chetola Lake for raw water supply during emergency conditions, a permanent water supply solution is needed. The Blowing Rock Town Council recently resolved to work with the Town of Boone to develop a water system interconnect for addressing Blowing Rock's water supply needs.

The wastewater treatment plant (WWTP), which is rated to treat 0.8 MGD of wastewater, discharges to the Middle Fork of the South Fork of the New River. The Town also owns and operates its water distribution and wastewater collection facilities.

Due to the age and condition of facilities within the water and wastewater systems, a listing of recommended improvements has been developed. The improvements are categorized by raw water, water treatment, water distribution, sewer collection, and wastewater treatment facilities.

This CIP addresses immediate and forthcoming improvements needed for the raw water source, water treatment plant, water distribution system, wastewater collection system, and wastewater treatment plant. The recommended improvements were developed and prioritized through an evaluation process that includes seven (7) key criteria:

- 1) Regulatory Compliance: Projects that are driven to meet current or forthcoming regulatory requirements.
- 2) System Viability and Reliability: Projects that increase the viability and/or reliability of the facility operations.
- 3) Workplace Safety and Environment: Projects that improve workplace safety and/or workplace environment for the system operators and employees.
- 4) Growth Related: Projects that are related to current or future expected growth.
- 5) Future Ready: Projects that prepare the facilities for the future.
- 6) Categorized: Projects that are easily grouped with or related to other CIP projects.
- 7) Fundable: Projects that currently have or potentially will have funding available.

The projects recommended for completion over the next ten years are described and presented in the text and tables throughout this CIP. The complete list of recommended projects is presented at the end of Section II.

SECTION II

RECOMMENDED IMPROVEMENTS

RAW WATER SOURCE

The raw water source for the Town of Blowing Rock is a small reservoir located on Flattop Branch, which is north of the Town limits on National Park Service property. This reservoir was increased to its current size in the late 1970s with an estimated volume of 45 MG. Raw water is transported to the water treatment plant through a 16-inch water line. The average daily demand for raw water is projected to be 0.65 MGD. Though the reservoir primarily drains undeveloped property, sediment has built up over the years resulting in the reduction of effective storage volume. To determine that if filling of the reservoir has become a problem, an intermediate step to dredging the lake would be to take depth findings and estimate the overall volume. Following is a project identified to maintain the reliability of the raw water source.

Improvements to Raw Water Reservoir (Project 1)

- a) Need for Project: The reservoir is the public water system's sole raw water source. The reservoir's capacity is decreasing due to sediment deposition from surface water.
- b) Description: This project involves the dredging and removal of the deposited silt and sediment in the reservoir.
- c) Budget Cost: \$294,000

WATER TREATMENT PLANT

As previously discussed, the water treatment plant (WTP) receives raw water from the Town's water supply reservoir. The WTP has a rated plant capacity of 2.0 million gallons per day (MGD). The facility, which was constructed nearly 30 years ago, is showing significant wear, as much of the original equipment is failing or has already been replaced. The treatment processes consist of chemical addition, flocculation, sedimentation, filtration, and chlorine addition and contact for disinfection. The WTP faces the challenge of meeting increasingly stringent water quality regulations. The primary challenge is to comply with these regulatory requirements at a reasonable cost with a plant that has many components nearing the end of their useful life. Several of the recommended projects listed in this CIP are directed to assist the Town in

reducing operating costs by extending the life of functional equipment, reducing safety risks, replacing obsolete equipment, and increasing the operational effectiveness of certain processes. Following are the projects identified to improve the water treatment plant.

General WTP Improvements (Project 2)

- a) Need for Project: Access to the WTP basement is limited due to the size of the existing access doors. The basement area has no ventilation, though the area stores chemicals. Hydronic unit heaters in the basement and sedimentation basin area have failed, and replacement parts are unavailable. Also, telemetry is needed to monitor status of the water system pressure relief valves to detect water loss. Finally, due to aging equipment and facilities, many general improvements are needed at the WTP.
- b) Description: This project involves various improvements at the WTP including a new overhead coiling door in the basement, new ventilation in the basement, repair of the chemical room door, replacement of miscellaneous doors, new unit heaters, telemetry installation for pressure relief valves, and other miscellaneous improvements.
- c) Budget Cost: \$200,000

Sedimentation Basin Residuals Removal System (Project 3)

- a) Need for Project: The sedimentation basins in the WTP, which are used for the settling of solids prior to filtering, do not have residuals removal equipment. The operators periodically take a basin out of service to remove residuals. The basin has to be dewatered and hosed down to move the residuals to one end of the basin where it can be removed. Because the residuals collection and removal process is difficult and labor intensive, residuals accumulate and sits for extended period of times in the basins, which can decrease the effectiveness of the settling process.
- b) Description: This project involves the installation of residuals removal equipment to allow operators to easily remove residuals on a regular basis. The equipment would involve a "Trac-Vac" type system, which removes residuals by means of suction generated through differential head or pumping.
- c) Budget Cost: \$240,000

Washwater Pumping System (Project 4)

- a) Need for Project: Reliability in discharging backwash wastewater from the WTP filters and increased backwash capacity are needed. Currently only one pump transfers washwater to the wastewater plant. The pump is located in the basement of

the WTP, and the motor and electrical connections become submerged when flooding occurs in the basement. Also, washwater is collected in a small sump with a capacity of only approximately 30 seconds of pumping capacity time. Therefore, the pump often draws in air, or even runs dry, causing pump damage.

- b) Description: This project involves the installation of a washwater drain line from the existing sump, around the WTP to a proposed submersible pump station located between the sedimentation basins and the finished water clearwell. This pump station would house two (2) pumps for redundancy and increased pumping capacity. The existing force main from the WTP to the WWTP would be reused. Flow equalization entering the WWTP will be provided in another project at the WWTP.
- c) Budget Cost: \$420,000

Repair / Replace Valves and Piping (Project 5)

- a) Need for Project: The high service pump check valves are leaking, as much as 75 gallons per minute, and need to be replaced. Also, the pressure reducing valve for the plant service water needs to be replaced, along with installation of a backflow preventer. In addition, the finished water pump valves need to be rebuilt. Finally, several valves, fittings, and piping exposed in the WTP basement have been abandoned, but have remained in place. These items cause water leaks, complications in operations, and safety hazards, and thus should be removed.
- b) Description: This project involves the repair and replacement of several valves in the WTP basement. Also included are the removal of abandoned valves and piping, which are no longer in use.
- c) Budget Cost: \$110,000

Storage Building at WTP (Project 6)

- a) Need for Project: There is no designated area or building for storage of miscellaneous items at the WTP.
- b) Description: This project involves the addition of a storage building on the south side of the existing WTP over the basement area.
- c) Budget Cost: \$80,000

Pipe Coating Program (Project 7)

- a) Need for Project: Existing piping and pipe joints in the WTP basement are corroded and dirty from many years in a chemical treatment environment.
- b) Description: The piping and pipe joints in the WTP basement would be cleaned and then recoated to extend the life of the pipe and to prevent further corrosion.
- c) Budget Cost: \$88,000

Fence WTP Site (Project 8)

- a) Need for Project: To reduce the vulnerability of the water treatment systems, the plant site should be completely secure.
- b) Description: A chain link fence with barbed wire should be installed in select areas to tie-in to the existing fence. A new swinging gate would be installed for access to the clearwell and basement area.
- c) Budget Cost: \$16,000

Chemical Tank Containment Wall (Project 9)

- a) Need for Project: The chemical tanks in the basement need surrounding containment walls that would contain the entire volume of stored liquid in case of a spill or leak.
- b) Description: This project involves the installation of a liquid-tight CMU block wall around chemical tanks in the basement area of the water treatment plant. The wall height and alignment would be determined during the design phase.
- c) Budget Cost: \$44,000

Slope Basement Floor (Project 10)

- a) Need for Project: Due to leaking pumps and piping and inadequate drainage, water typically stands on the basement floor and creates both safety and aesthetic issues.
- b) Description: This project involves the installation of grout and floor trench drains as needed to promote the positive drainage of water within the basement floor area.
- c) Budget Cost: \$88,000

Clean and Coat WTP Exterior Concrete (Project 11)

- a) Need for Project: The exterior concrete on the water treatment plant has become stained and dirty over the years. There are also areas where water seeps from cracks in the treatment basin walls.
- b) Description: This project involves the sealing of cracks in the basin walls, along with the cleaning and coating of the exposed concrete of the structure.
- c) Budget Cost: \$37,000

**TABLE 1
WATER TREATMENT PLANT PROJECTS**

No.	CAT	PROJECT DESCRIPTION	ESTIMATED COST
2	WTP	General WTP Improvements	\$ 200,000
3	WTP	Sedimentation Basin Residuals Removal System	\$ 240,000
4	WTP	Washwater Pumping System	\$ 420,000
5	WTP	Repair / Replace Valves and Piping	\$ 110,000
6	WTP	Storage Building at WTP	\$ 80,000
7	WTP	Pipe Coating Program	\$ 88,000
8	WTP	Fence WTP Site	\$ 16,000
9	WTP	Chemical Tank Containment Wall	\$ 44,000
10	WTP	Slope Basement Floor	\$ 88,000
11	WTP	Clean and Coat WTP Exterior Concrete	\$ 37,000
TOTAL ESTIMATED COST			\$1,323,000

WATER DISTRIBUTION SYSTEM

Finished water from the water treatment plant is transported via high service pumps to the water distribution system. The distribution system consists of approximately 21 miles of water mains and contains 3.5 million gallons of finished water storage. The water distribution system is in relatively good condition, and thus the water distribution system projects will be low on the priority list. Following are the projects identified to improve the water distribution system.

Upgrade Wonderland Trail Water Main (Project 12)

- a) Need for Project: Additional water transmission capacity is needed for the water main along Wonderland Trail due to insufficient pipe size.
- b) Description: This project involves the replacement of the existing 4" cast iron water line with a new 8" water main on Wonderland Trail from Laurel Lane to Valley View Road.
- c) Budget Cost: \$90,000

Water Interconnect with Town of Boone (Project 13)

- a) Need for Project: An interconnection is needed with the Town of Boone's water distribution system to provide water supply to meet the Town's needs.
- b) Description: This project involves the installation of a water interconnect with the Town of Boone involving 24,000 linear feet of 12" water main, a 500,000 gallon water storage tank, and a water booster station. The water line would begin at Tweetsie Railroad, the proposed service area boundary, and extend south to the WTP. A line would be constructed along Edmisten Road, to an elevation sufficient to install a ground water storage tank at an elevation equal to the Green Hill water tank. A booster pumping station will also be required. We have assumed that water supply from Boone will have sufficient pressure at the point of interconnect during pumping conditions.
- c) Budget Cost: \$2,580,000

Water Meter Replacement Program

- a) Need for Program: In order to ensure accuracy and reliability in water billing, replacement of old and outdated water meters is needed on a routine basis.
- b) Description: This program involves the replacement of individual water meters on an annual basis over the next 10 years. Old existing water meters would be replaced with new, reliable water meters.
- c) Budget Cost: \$100,000 (\$10,000 annually)

Water Tank Maintenance

- a) Need for Program: In order to ensure the reliability and proper operation of the existing water tanks, maintenance and structural inspections are needed on a routine basis.
- b) Description: This program involves the maintenance and structural inspection of the existing 3.0 million gallon water storage tank in the water distribution system every two years. The 500,000 gallon clearwell at the water treatment plant would also be maintained in accordance with this proposed schedule.
- c) Budget Cost: \$100,000 (\$20,000 biannually)

**TABLE 2
WATER DISTRIBUTION SYSTEM PROJECTS**

No.	CAT	PROJECT DESCRIPTION	ESTIMATED COST
12	WD	Upgrade Wonderland Trail Water Main	\$ 90,000
13	WD	Water Interconnect with Town of Boone	\$ 2,580,000
N/A	WD	Water Meter Replacement Program	\$ 100,000
N/A	WD	Water Tank Maintenance	\$ 100,000
TOTAL ESTIMATED COST			\$ 2,870,000

WASTEWATER COLLECTION SYSTEM

The Town operates and maintains a sewer collection system with raw wastewater flow from residential and commercial users. The majority of the collection is gravity sewer (approximately 10 miles of lines) with only one major pump station (Mayview) serving the western section of Town, one intermediate pump station serving portions of Chetola, and two small pump stations serving pockets on Grandfather Street and Chestnut Circle. Raw wastewater flow ultimately collects at the northern portion of the town and flows to the wastewater treatment through a 12-inch gravity sewer. The improvements needed for the wastewater collection system can be categorized by the following types of projects: 1) reliability and viability; 2) upgrading of existing sewers that are inadequate to transport current and future flows; 3) inflow and infiltration reduction. Following are the projects identified to improve the wastewater collection system.

New Generator for Grandfather and Chestnut Lift Stations (Project 14)

- a) Need for Project: A redundant power supply is needed at these lift stations to prevent sanitary sewer overflows during primary power outages.
- b) Description: This project involves the installation of a generator at the Grandfather Lift Station with a transfer switch and connection to the Chestnut Lift Station. An intermediate step to solving this problem would be installation of power transfer switches and portable generator connections at each station. Telemetry would also notify the operators if a power failure occurred.
- c) Budget Cost: \$60,000

Upgrade Interceptor Sewer from the WWTP to Sunset Drive (Project 15)

- a) Need for Project: The existing interceptor sewers from the WWTP to Sunset Dr. cannot accommodate peak flows that occur during heavy rain events. Increased flows are primarily derived from infiltration and inflow (I/I) in the western portion of the system flowing to the Mayview Lift Station. Addressing the I/I in the system is the first step in addressing flows in this portion of the system. Projects 16 and 17 planned first to identify, then repair problems. Should additional capacity still be needed, the line sizes should be increased.
- b) Description: This project involves the replacement of the existing 12" gravity sewer with an 18" gravity sewer from the WWTP to Sunset Drive. Also, included is

replacement of the existing 8" gravity sewer with a 12" gravity sewer along Sunset Drive and portions of Ransom Street.

- c) Budget Cost: \$830,000

Infiltration and Inflow (I/I) Study (Project 16)

- a) Need for Project: The existing collection system, in particular the western portions which flow to the Mayview Lift Station, receive excessive flow during wet weather events. Peak flows have caused sanitary sewer overflows in the past downstream of the Mayview lift station discharge, and cause upset to the wastewater treatment process.
- b) Description: This project involves undertaking an I/I study to develop a strategy for reducing wet weather flow to the Mayview Lift Station.
- c) Budget Cost: \$40,000

Infiltration and Inflow (I/I) Repairs in Collection System (Project 17)

- a) Need for Project: The existing collection system receives excessive flow during wet weather events, which as a result causes sewer overflows, and sends excessive flows to the WWTP.
- b) Description: This project involves the implementation of repairs that would be recommended as a result of the proposed I/I study. As these needs have yet to be quantified, the cost for this project is simply an estimate to establish budgetary considerations.
- c) Budget Cost: \$1,000,000

**TABLE 3
WASTEWATER COLLECTION SYSTEM PROJECTS**

No.	CAT	PROJECT DESCRIPTION	ESTIMATED COST
14	SC	New Generator for Grandfather and Chestnut Lift Stations	\$ 60,000
15	SC	Upgrade Interceptor Sewer from WWTP to Sunset Drive	\$ 830,000
16	SC	Infiltration and Inflow (I/I) Study	\$ 40,000
17	SC	Repair Infiltration and Inflow (I/I) in Collection System	\$1,000,000
N/A	SC	Collection System Extensions – Current (see Table 4)	\$1,949,000
N/A	SC	Collection System Extensions – Future (see Table 4)	\$2,516,000
TOTAL ESTIMATED COST			\$6,395,000

Collection System Extensions

- a) Need for Program: Collection system extension projects are needed in order to complete sewer service to all residences within the Town limits.
- b) Description: This program involves the construction of collection system extensions, which are listed in Table 4, on a regular basis. Sewer extension projects are included that are currently planned to service existing residences. Also included are future collection system extensions; i) to serve undeveloped areas within the Town limits, ii) the sewer relocations to be constructed by NCDOT during the widening of US 321 Bypass, and iii) to serve the Laurel Park area.
- c) Budget Cost: \$4,465,000

**TABLE 4
COLLECTION SYSTEM EXTENSION PROJECTS**

PROJECT DESCRIPTION	CS No.	TOTAL LENGTH	PROJECT COSTS (CURRENT)	PROJECT COSTS (FUTURE)
Cliff Dwellers Area	3	2400 LF	\$ 205,000	
Cone Road to 221	4	1600 LF		\$ 142,000
Cone Road to Existing Line at Maintenance Garage	5	800 LF	\$ 66,000	
Mayview Rock Road - Laurel Lane to Existing Line	6	1300 LF	\$ 105,000	
Ransom Street & Church Street to Existing Line	9	560 LF	\$ 47,000	
Mt. View Drive & North White Pine Street to Existing Line	10	800 LF	\$ 64,000	
Spruce Road to Existing Line	11	1050 LF	\$ 88,000	
Azalea Drive & Sunset Drive to Existing Line	12	1100 LF	\$ 94,000	
Meadow Lane to Laurel Lane to Existing Line	14	1680 LF	\$ 141,000	
Clark Street to Existing Line	15	500 LF		\$ 42,000
Laurel Lane Cutback to Existing Line	16	800 LF	\$ 70,000	
Birch Drive to Existing Line	18	870 LF	\$ 71,000	
Street South of Hill Street Across Main Street to Existing Line	19	680 LF	\$ 62,000	
Edgewood Path to Existing Line	21	540 LF	\$ 45,000	
Meadow Lane Across to Existing Line on Wonderland Trail	22	850 LF	\$ 74,000	
Wonderland Trail to Existing Line on Laurel Lane	23	1120 LF	\$ 95,000	
Wonderland Trail to Valley View Road to Existing Line	24	720 LF	\$ 62,000	
(3) Pump Stations back to 321 Business	27	6000 LF		\$ 863,000
Goforth Road to Existing Line	28	1850 LF	\$ 148,000	
Wonderland Drive to Green Hill Road	29	3550 LF		\$ 289,000
Country Club Drive North to Existing Line	37	1300 LF	\$ 110,000	
Country Club Drive South to Fairway Lane	38	1250 LF	\$ 103,000	
Balance of Norwood Circle	39	600 LF		\$ 39,000
Trillium to Existing Line on Hayes Road	40	300 LF	\$ 28,000	
321 Overlooking the Globe to Existing Line on 321 Bypass	41	1400 LF		\$ 116,000
321 Bypass & Hayes Road to Existing Line at Crystal Lake	42	2840 LF		\$ 226,000
321 Business, Chestnut, & Grandfather to Existing Line on 321 Business at Chestnut	43	3400 LF	\$ 271,000	
Laurel Park Road	44	5290 LF		\$ 440,000
Dogwood Lane, Springs Rd, & Buxton Street to Laurel Park Rd	45	2800 LF		\$ 249,000
Quail Hollow to Laurel Park Road	46	1300 LF		\$ 110,000
TOTAL ESTIMATED COSTS			\$1,949,000	\$2,516,000

WASTEWATER TREATMENT PLANT

The Blowing Rock wastewater treatment plant was expanded to its current capacity of 0.8 MGD in 1988. Wastewater is screened as it enters the WWTP, prior to entering the flow equalization basin. Treatment processes include manual screening, flow equalization, influent pumping, conventional activated sludge aeration, clarification, chlorine addition and contact for disinfection, dechlorination, and post-aeration. Waste sludge from the activated sludge treatment process is stored in an aerobic digester before being transported to the City of Lenoir for ultimate disposal. The WWTP discharges treated effluent to the Middle Fork of the South Fork of the New River under NPDES Permit No. NC0027286, which expires on March 31, 2006.

This evaluation included site visits and discussion with the plant staff to further understand the operation parameters of the plant and identify deficiencies. An engineering review of these deficiencies was performed to determine what improvements are necessary for each unit process to accommodate flows and loadings. Several of the recommended projects listed in this CIP are directed to assist the Town in reducing operating costs by extending the life of functional equipment, reducing safety risks, replacing obsolete equipment, and increasing the operational effectiveness of certain processes. Following are the projects identified to improve the wastewater treatment plant.

New Mechanical Fine Screen and Compactor (Project 18)

- a) Need for Project: The existing influent channel contains four (4) manually-cleaned bar racks that remove undesirable inorganic material from the flow stream. The screens become clogged quickly, which can cause the water to surcharge in the channel. As screens become clogged, much of the undesirable material passes through the screens into the treatment system. Also, access to the existing dumpster for disposal of screenings is along a steep wooden ramp, which is an unsafe condition for the operators. The screenings, which are wet and stringy, cause odor problems and create health concerns.
- b) Description: This project involves the installation of a mechanical (cylindrical type) fine screen in one of the influent channels. The second channel would be used as a bypass channel. A conveyor will be installed to transport screenings to a small dumpster adjacent to the facility.
- c) Budget Cost: \$160,000

Air Piping and Diffusers in Aeration Tanks (Project 19)

- a) Need for Project: Air transfer and distribution in the existing aeration tanks is not consistent, which hampers oxygen transfer for biological treatment, and promotes foaming due to insufficient aeration and mixing. Less than 50 percent of the existing air headers are operating correctly. The existing air drop pipes are connected to the air header with flexible compression couplings. The gaskets on these couplings dry rot over time and lose their seal, or cannot be reinstalled once the pipe is removed.
- b) Description: This project involves the testing of the aeration system to determine the areas that need additional air transfer. New air drop pipes, pipe couplings, and air diffusers would be installed as needed to improve air transfer and distribution.
- c) Budget Cost: \$110,000

Flow Diversion Structure Improvements (Project 20)

- a) Need for Project: The existing flow diversion structure upstream of the aeration tanks does not provide consistent or even distribution of influent and return activated sludge (RAS) flow under normal flow conditions. The RAS piping enters the structure off-center, and a fitting was installed to direct flow to the center. This elbow directs the flow to only two (2) basins when the influent pumps are off, while the flow primarily enters the other two basins when the influent pumps are operating.
- b) Description: This project involves the installation of new weir gates and deflector plates as needed to improve flow distribution in the splitter box. A new RAS pipe connection would be installed at the center of the structure to aid in flow splitting.
- c) Budget Cost: \$42,000

New Aerobic Digester, Expanded Flow Equalization Basin, and Sludge Pump Station

(Project 21)

- a) Need for Project: The aerobic digester at the WWTP does not operate sufficiently or efficiently and is undersized for the plant capacity. The WWTP cannot thicken sludge efficiently prior to transport, resulting in higher hauling costs. Limited capacity also creates management and timing of sludge wasting and disposal difficult. The sludge air lifts that transport sludge from the clarifier hoppers to the aeration tanks do not operate properly or reliably due to built-up sludge, grit, and other undesirable material that impair the pumping process. When sludge cannot be removed from the clarifiers, denitrification occurs in the clarifiers causing residuals to surface in the clarifier and eventually discharge to the chlorine contact basin. Additionally, the flow equalization basin is not sufficiently sized to dampen raw wastewater flows and water treatment residual flows, which results in hydraulic upsets in the treatment process.
- b) Description: This project involves the addition of a new 200,000 gallon aerobic digester for the stabilization of sludge. The digester basin would be added on to the existing aeration tanks and would include new aeration and mixing equipment, blowers, and associated sludge piping. The existing aerobic digester would be converted into a flow equalization basin to be used for the equalization of sludge flows from the water treatment plant. Additionally, the existing sludge pumping system would be replaced with a new sludge pump station. Pipes would be installed from each sludge hopper to a new RAS pump station, which would then pump sludge to the flow diversion structure. Sludge would be drawn from the clarifier hoppers by use of telescopic valves for flow control. A new waste sludge line tie-in would be provided upstream of the flow diversion structure to transport sludge to the new aerobic digester.
- c) Budget Cost: \$1,230,000

Treatment Basin Handrails (Project 22)

- a) Need for Project: The existing handrails on the pre-cast aeration basins are leaning and unstable. The supports are breaking away from the concrete in many areas, which creates unsafe working conditions.
- b) Description: This project involves the repair and/or installation of handrail and supports as needed to restore the workplace to a safe condition.
- c) Budget Cost: \$58,000

New Emergency Generator for WWTP (Project 23)

- a) Need for Project: The existing emergency generator is not sufficiently sized to operate the minimum treatment processes during a power outage.
- b) Description: This project involves the installation of a new emergency generator and automatic transfer switch sufficiently sized to operate the minimum treatment processes, including pumps and blowers, and other ancillary power during power outages.
- c) Budget Cost: \$160,000

**TABLE 5
WASTEWATER TREATMENT PLANT PROJECTS**

No.	CAT	PROJECT DESCRIPTION	ESTIMATED COST
18	WW	New Mechanical Fine Screen and Compactor	\$ 160,000
19	WW	Air Piping and Diffusers in Aeration Tanks	\$ 110,000
20	WW	Flow Diversion Structure Improvements	\$ 42,000
21	WW	New Aerobic Digester, Expanded Flow Equalization Basin, and Sludge Pump Station	\$1,230,000
22	WW	Treatment Basin Handrails	\$ 58,000
23	WW	Replace Emergency Generator for WWTP	\$ 160,000
TOTAL ESTIMATED COST			\$1,760,000

SUMMARY

Table 6 summarizes the recommended projects for the raw water source, water treatment plant, waste distribution system, sewer collection system, and wastewater treatment plant. Table 8 summarizes the capital improvement programs previously discussed.

**TABLE 6
SUMMARY OF CIP PROJECTS AND PROGRAMS**

No.	CAT	DESCRIPTION	ESTIMATED COST
1	RW	Improvements to Raw Water Reservoir	\$ 294,000
2	WTP	General WTP Improvements	\$ 200,000
3	WTP	Sedimentation Basin Residuals Removal System	\$ 240,000
4	WTP	Washwater Pumping System	\$ 420,000
5	WTP	Repair / Replace Valves and Piping	\$ 110,000
6	WTP	Storage Building at WTP	\$ 80,000
7	WTP	Pipe Coating Program	\$ 88,000
8	WTP	Fence WTP Site	\$ 16,000
9	WTP	Chemical Tank Containment Wall	\$ 44,000
10	WTP	Slope Basement Floor	\$ 88,000
11	WTP	Clean and Coat WTP Exterior Concrete	\$ 37,000
12	WD	Upgrade Wonderland Trail Water Main	\$ 90,000
13	WD	Water Interconnect with Town of Boone	\$2,580,000
N/A	WD	Water Meter Replacement Program	\$ 100,000
N/A	WD	Water Tank Maintenance	\$ 100,000
14	SC	New Generator for Grandfather and Chestnut Lift Stations	\$ 60,000
15	SC	Upgrade Interceptor Sewer from WWTP to Sunset Drive	\$ 830,000
16	SC	Infiltration and Inflow (I/I) Study	\$ 40,000
17	SC	Repair Infiltration and Inflow (I/I) in Collection System	\$1,000,000
N/A	SC	Collection System Extensions – Current	\$1,949,000
N/A	SC	Collection System Extensions – Future	\$2,516,000
18	WW	New Mechanical Fine Screen and Compactor	\$ 160,000
19	WW	Air Piping and Diffusers in Aeration Tanks	\$ 110,000
20	WW	Flow Diversion Structure Improvements	\$ 42,000
21	WW	New Aerobic Digester, Expanded Flow Equalization Basin, and Sludge Pump Station	\$1,230,000
22	WW	Treatment Basin Handrails	\$ 58,000
23	WW	Replace Emergency Generator for WWTP	\$ 160,000
-TOTAL ESTIMATED PROJECT COSTS			\$12,642,000

SECTION III

SUMMARY AND CONCLUSION

The Town's water and wastewater systems generally function in compliance with regulatory requirements. However, capital improvements are needed for the raw water source, water treatment plant, water distribution system, wastewater collection system, and wastewater treatment plant. Following is a summary of the capital improvement projects that are recommended for the water and wastewater facilities.

RAW WATER SOURCE

1. Improvements to Raw Water Reservoir

WATER TREATMENT PLANT

2. General WTP Improvements
3. Sedimentation Basin Residuals Removal System
4. Washwater Pumping System
5. Repair / Replace Valves and Piping
6. Storage Building at WTP
7. Pipe Coating Program
8. Fence WTP Site
9. Chemical Tank Containment Wall
10. Slope Basement Floor
11. Clean and Coat WTP Exterior Concrete

WATER DISTRIBUTION SYSTEM

12. Upgrade Wonderland Trail Water Main
13. Water Interconnect with Town of Boone

WASTEWATER COLLECTION SYSTEM

14. New Generator for Grandfather and Chestnut Lift Stations
15. Upgrade Interceptor Sewer from WWTP to Sunset Drive
16. Infiltration and Inflow (I/I) Study
17. Repair Infiltration and Inflow (I/I) in Collection System

WASTEWATER TREATMENT PLANT

18. New Mechanical Fine Screen and Compactor
19. Air Piping and Diffusers in Aeration Tanks
20. Flow Diversion Structure Improvements
21. New Aerobic Digester, Expanded Flow Equalization Basin, and Sludge Pump Station
22. Treatment Basin Handrails
23. Replace Emergency Generator for WWTP

Project cost estimates, which are based upon 2005 construction costs, have been prepared for each project and outlined earlier in this report. In addition to the twenty-three (23) projects described in this CIP, budget line items have been added for a water meter replacement program, periodic water tank maintenance, and thirty (30) proposed sewer extensions.

In discussions with City officials, it has been determined that the first CIP project will involve a joint improvements project at the water treatment plant and wastewater treatment plant. The estimated project cost for this project is approximately \$2,000,000. Projects at the water treatment plant include the Washwater Pumping System (Project 4), Repair and Replacement of Valves and Piping (Project 5), and Fencing the WTP Site (Project 8). Projects at the wastewater treatment plant include the New Mechanical Fine Screen and Compactor (Project 18), the Flow Diversion Structure Improvements (Project 20), and the sludge project involving the New Aerobic Digester, Expanded Flow Equalization Basin, and Sludge Pump Station (Project 21). General improvement projects at the water treatment plant will be included in the project as alternate bid items and will be installed as the budget allows.

The debt service for the 1978 water treatment plant project will be retired in 2011. After this date, additional capital funds will be available on an annual basis to fund raw water, water treatment, and water distribution projects. The water interconnect project with the Town of Boone's water system will meet the Town's water supply needs, serve as an important reliability project, and thus should be undertaken following retirement of the WTP debt. The improvements to the raw water reservoir will provide some additional water storage, but will not significantly increase the water supply for the Town. Also, water quality in the reservoir has not been adversely affected by the deposition of sediment in the reservoir. Therefore, the water

interconnect with the Town of Boone is a higher priority than the reservoir project in the Capital Improvements Plan.

There are a few projects in the Capital Improvements Plan that are proposed to be undertaken on an annual basis because they could easily be divided into separate components or projects. Repairs to the collection system to remove I/I are proposed to be budgeted at \$75,000 per year, although total budget needs over a 10-year period could well exceed \$750,000. The true extent of needed repairs will be unknown until the I/I Study is performed in the first budget year. Sewer collection extensions are estimated to cost \$1,949,000 over the 10-year planning period. Because there are twenty (20) current collection system extension projects which could be installed separately, it is proposed that groups of extension projects, as prioritized by Town officials, be undertaken on an annual or biannual basis.

Table 7 presents a 10-year schedule that will provide guidance to the Town for budgeting the proposed capital improvement projects and programs.

TOWN OF BLOWING ROCK - WATER AND SEWER CAPITAL IMPROVEMENTS PLAN
10 YEAR SCHEDULE 2006-2016 (amended May 2009)

CATEGORY / IMPROVEMENT	COST	YEAR 1 2006-2007	YEAR 2 2007-2008	YEAR 3 2008-2009	YEAR 4 2009-2010	YEAR 5 2010-2011	YEAR 6 2011-2012	YEAR 7 2012-2013	YEAR 8 2013-2014	YEAR 9 2014-2015	YEAR 10 2015-2016	Balance
Raw Water Source												
Improvements to Raw Water Reservoir	\$ 294,000											
SUBTOTAL	\$ 294,000							\$ 294,000				
Water Treatment Plant												
General WTP Improvements	\$ 200,000	\$ 50,000								\$ 75,000		\$ 75,000
Sedimentation Basin Residuals Removal System	\$ 240,000									\$ 240,000		
Washwater Pumping System	\$ 420,000	\$ 420,000										
Repair / Replace Valves and Piping	\$ 110,000	\$ 110,000										
Storage Building at WTP	\$ 80,000									\$ 80,000		
Pipe Coating Program	\$ 88,000									\$ 88,000		
Fence WTP Site	\$ 16,000	\$ 16,000										
Chemical Tank Containment Wall	\$ 44,000	\$ 44,000										
Slope Basement Floor	\$ 88,000	\$ 88,000										
Clean and Coat WTP Exterior Concrete	\$ 37,000	\$ 37,000										
SUBTOTAL	\$ 1,322,000											
Water Distribution System												
Upgrade Wondeland Trail Water Main	\$ 90,000				\$ 2,580,000				\$ 90,000			
Water Interconnect with Town of Boone	\$ 2,580,000				\$ 5,000	\$ 5,000	\$ 5,000	\$ 5,000	\$ 5,000	\$ 5,000	\$ 5,000	\$ 20,000
Water Meter Replacement Program	\$ 100,000	\$ 5,000	\$ 10,000	\$ 30,000	\$ 5,000	\$ 5,000	\$ 5,000	\$ 5,000	\$ 5,000	\$ 5,000	\$ 5,000	\$ 20,000
Water Tank & Clearwell Maintenance	\$ 150,000		\$ 10,000	\$ 25,000	\$ 15,000	\$ 25,000	\$ 10,000	\$ 25,000	\$ 10,000	\$ 10,000	\$ 10,000	
SUBTOTAL	\$ 2,920,000											
Wastewater Collection System												
New Generator for Grandfather & Chestnut Lift Stations	\$ 60,000								\$ 60,000			
Upgrade Interceptor Sewer from WWTP to Sunset Drive	\$ 830,000										\$ 830,000	
Infiltration and Inflow (I/I) Study	\$ 40,000	\$ 40,000										
Repair Infiltration and Inflow (I/I) in Collection System	\$ 1,000,000	\$ 50,000	\$ 50,000	\$ 75,000	\$ 50,000	\$ 50,000	\$ 25,000	\$ 41,000	\$ 50,000	\$ 70,000	\$ 70,000	\$ 469,000
Collection System Extensions (See Page 2)	\$ 1,949,000	\$ 40,000	\$ 25,000	\$ 100,000	\$ 72,000	\$ 80,000	\$ 40,000	\$ 50,000	\$ 100,000	\$ 100,000	\$ 100,000	\$ 1,242,000
SUBTOTAL	\$ 3,879,000											
Wastewater Treatment Plant												
New Mechanical Fine Screen and Compactor	\$ 160,000	\$ 160,000										
Air Piping and Diffusers in Aeration Tanks	\$ 110,000								\$ 110,000			
Flow Diversion Structure Improvements	\$ 42,000	\$ 42,000										
New Aerobic Digester, Expanded Flow Equalization Basin, and Sludge Pump Station	\$ 1,230,000	\$ 1,230,000										
Treatment Basin Handrails	\$ 58,000				\$ 58,000							
Replace Emergency Generator for WWTP	\$ 160,000					\$ 40,000	\$ 120,000					
SUBTOTAL	\$ 1,760,000											
TOTAL ANNUAL CAPITAL IMPROVEMENTS	\$ 10,176,000	\$ 2,332,000	\$ 95,000	\$ 230,000	\$ 2,780,000	\$ 200,000	\$ 200,000	\$ 415,000	\$ 425,000	\$ 668,000	\$ 1,015,000	\$ 11,816,000