Town of River Bend

An Introduction to Wastewater Treatment

July 1, 2012

The Treatment Process

Sewage treatment is a multi-stage process to renovate our wastewater before it is discharged to the sensitive waters of the Trent River. Our permit requires that we monitor and report the level of nutrients and other chemicals that we can discharge. The goal is to reduce or remove organic matter, solids, nutrients, disease-causing organisms, and other pollutants from wastewater.

Primary treatment

Upon arrival via the sewer system, the wastewater is sent through a bar screen which removes large solid objects such as sticks, rags, and other similar material which is sent to the landfill. Leaving the bar screen, the wastewater flow is slowed down entering the grit tank. This allows sand, gravel, and other heavy material that was small enough not to be caught by the bar screen to settle to the bottom. All the collected debris from the grit tank is pumped out every two to three years and disposed of.

After leaving the grit chamber the wastewater goes to our "surge tank". This large tank is where the waste is held pending movement into the next phase of the treatment process. While in the surge tank, the waste is aerated, using air produced by three high volume blowers we maintain in an enclosed building at the treatment plant, in order to keep it "fresh". Using the surge tank, our operators are able to reduce the peaks and valleys of daily wastewater flow to the treatment plants. They do not want too much waste to enter at once and overwhelm the treatment capacity of the organisms in the plants, nor do they want too little waste, which can also effect the quality of treatment. From the surge tank, waste is pumped through a splitter box to the two package treatment plants we operate for secondary treatment.

Secondary treatment

Secondary treatment is a biological treatment process that removes dissolved organic material from wastewater. Once in the package plant it is mixed, in an aeration tank, with solids containing micro-organisms that use oxygen to consume the remaining organic matter in the wastewater as their food supply. The aeration tank uses air bubbles, again supplied by the blowers described above, to provide the mixing and the oxygen, both of which are needed for the micro-organisms to multiply.

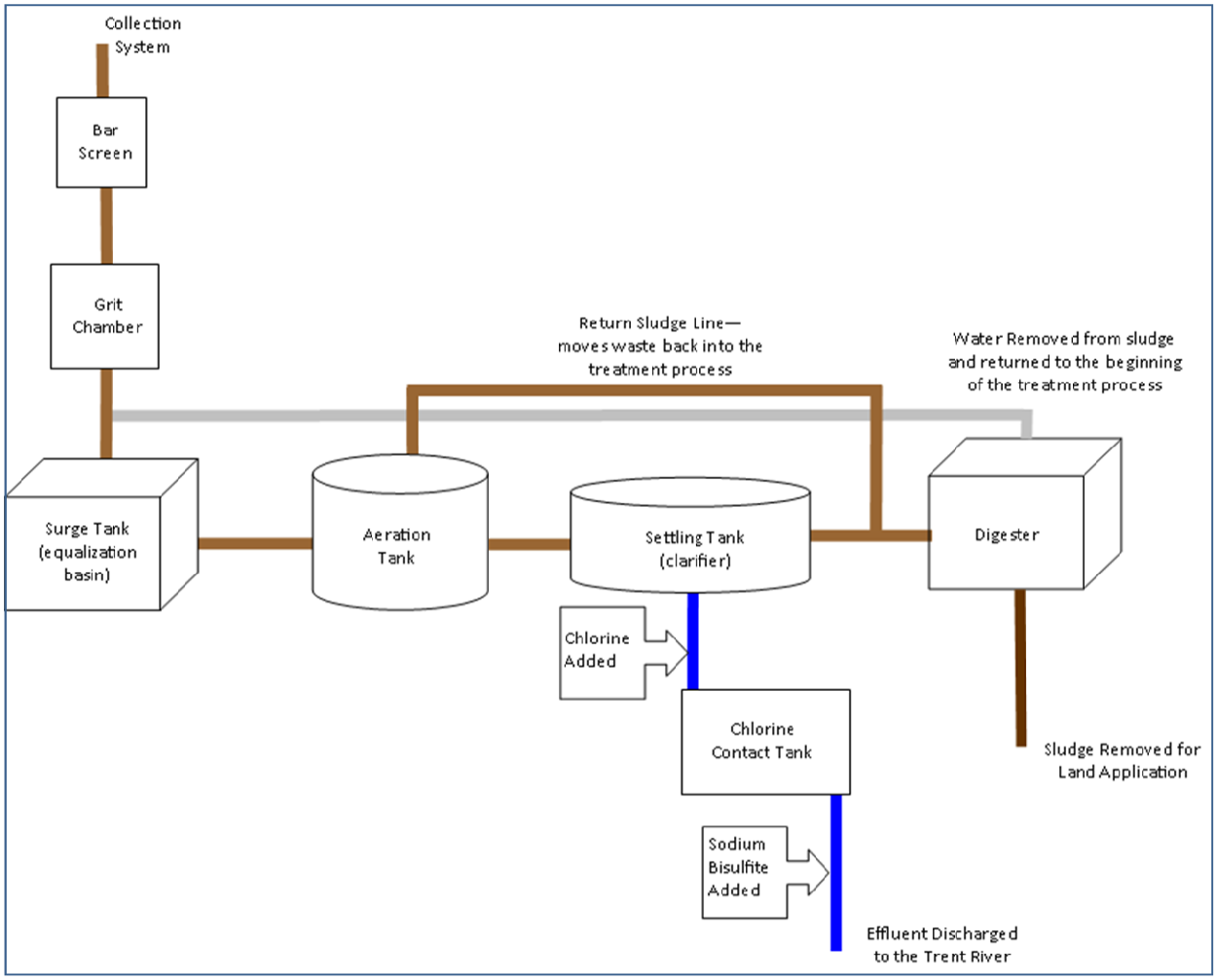
From here the liquid mixture, composed of solids with micro-organisms and water, is sent to the clarifier portion of the package plant. Here the solids settle to the bottom where some of the material is sent to the solids handling process, and some is recirculated to replenish the population of micro-organisms in the aeration tank to treat incoming wastewater. The removal of solids to the digester is an operation that is called "wasting" of sludge. Our operators use their experience, various measurements, and test results to determine the best time to waste in order to maintain a good environment within the treatment process.

Disinfection

The now cleaner wastewater coming from the clarifiers is disinfected using Sodium Hypochlorite (bleach) liquid to kill harmful micro-organisms while being held in a large tank before moving on to the final step in the process. Because chlorine can be harmful in sensitive waters, we are required to remove residual chlorine. Our operators accomplish this by injecting a Sodium Bisulfite solution to the effluent. The disinfected and dechlorinated water is then discharged to the Trent River. Chlorine and Sodium Bisulfite are the only chemicals used in our treatment process. It is entirely a biological and mechanical system that takes raw sewage and cleans it for discharge to the river. Our operators also use, as needed and very sparingly, chlorine "sticks" to clean the weirs on the clarifiers. This helps reduce the build-up of algae on the surface of the weirs, thus reducing their effectiveness.

Solids Handling

Solids from the clarifier are sent to the digester. In the digester, micro-organisms use the organic material present in the solids as a food source and convert it to by-products such as methane gas and water. Digestion results in a 90% reduction in pathogens and the production of a wet soil-like material called "biosolids" that contain 95-97% water. Our operators, prior to sludge removal, decant as much water as they can from the mixture to ensure we are not paying to transport and spread water. This decanted water is sent back to the head of the treatment process to mix with incoming waste. To the remaining biosolids our operators add powdered Hydrated Lime to adjust the pH of the solids prior to their removal by a contractor who applies them to agricultural fields.



Testing

Our operators, who are on duty seven days a week, are required by our permit to take samples each day and perform in house analysis on some and ship others to a laboratory with which we contract. In addition to the required tests, our operators do additional tests to ensure that the treatment process is working as it should. The cost of the external laboratory testing is shown on the table to the right.

Testing by Outside Laboratory	Test Required by Permit		Testing Frequency	Cost per test	Annual # of tests	Total Annual Cost
	Yes	No				
Biochemical Oxygen Demand (BOD)	X		Weekly in influent and effluent	17	104	1,768
Suspended Solids	X		Twice monthly in influent and effluent	11	48	528
Ammonia Nitrogen	X		Weekly in effluent	11	52	572
Total Nitrogen	X		2/month in effluent + summer river monitoring*	50	60	3,000
Total Phosphorus	X		2/month in effluent + summer river monitoring*	29	60	1,740
Nitrate	X		2/month in effluent + summer river monitoring*	28	60	1,680
Enterococcus	X		Weekly in effluent	50	52	2,600
Chlor A	X		Weekly in summer monitoring period	110	18	1,980
						$13,868
Testing Performed In-House						
Dissolved Oxygen	X		Daily in both plants and effluent			
pH	X		Daily in effluent			
Temperature	X		Daily in each treatment plant + summer river monitoring*			
Chlorine	X		Daily in both plants and effluent			
Solids level / sludge level		X	Daily in both plants			
Salinity	X		Summer river monitoring			
			***Summer River Monitoring**: From June 1 through September 30, we must test and report results each week at a location upstream of our discharge to the Trent River and a location downstream of our discharge.			

Water Operations Staff

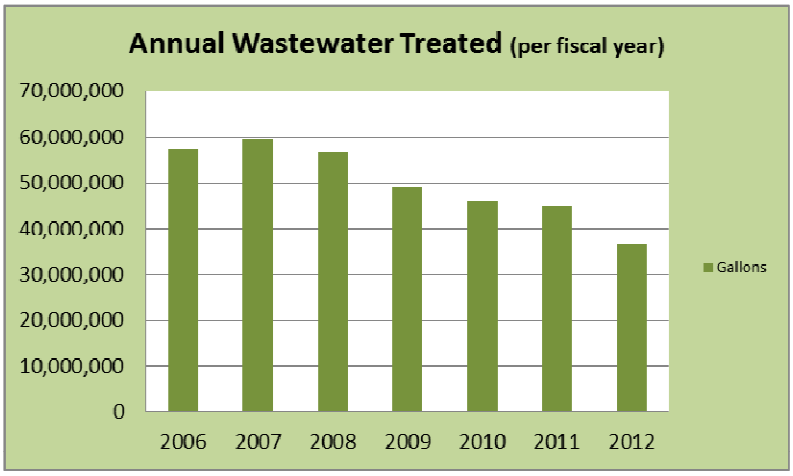
Water and wastewater utilities require professional staff to operate and maintain them. State regulations establish the minimum requirements for licensure of our operators and only allow certified people to operate either system. We are fortunate to have a full time staff of four licensed operators. River Bend has enjoyed a long relationship with Lenoir Community College from where we get quality students from their Environmental Science program who are interested in working in the water and wastewater field. All of our current staff are products of this program.

Brandon Mills, Director of Public Works
Associates Degree in Environmental Science Water Resources Management, Lenoir Comm. Col.
Water Certifications: B-Well, B-Distribution
Sewer Certifications: Wastewater III, Collections II, Physical/Chemical I

Tommy Harper, Operator
Associates Degree in Environmental Science Water Resources Management, Lenoir Comm. Col.
Water Certifications: B-Well, C-Distribution
Sewer Certifications: Wastewater II, Collections I, Physical/Chemical I

Lamar Trowell, Operator
Lenoir Community College Environmental Science Water Resources Management Program
Bachelors Degree in Psychology
Associates Degree in Criminal Justice
Associates Degree in Industrial Security
Water Certifications: C-Well, B-Distribution
Sewer Certification: Wastewater II, Collections I

Wastewater Treated



Our permit from the Department of Environment and Natural Resources allows us to discharge 330,000 gallons of wastewater per day into the Trent River—over 120 million gallons per year. Our records show, as reflected on the graph to the right, that we typically use between just under one half of our permitted capacity. On average, over the last seven years, we treated and discharged just over 137,000 gallons of water per day.

Our wastewater treatment and collection system serves approximately 935 households and businesses. Wastewater is collected from our customers and transmitted via approximately 11 miles of gravity and force main pipes. Nine lift stations pressurize portions of the system so the waste is efficiently moved to our treatment facility on Gull Pointe Drive. Seven of these lift stations, and the treatment plant itself, have backup power supplied by fixed location generators. The other two lift stations can be powered by one of our mobile generators.