



# The Challenges of **Inflow and Infiltration**

City of Wilson  
Wastewater Collection  
and Treatment Report  
Fiscal Year 2014-2015



# THE CHALLENGES OF INFLOW AND INFILTRATION

Inflow and infiltration (I/I) are terms describing ways that stormwater runoff and groundwater make their way into wastewater collection pipes and eventually get treated, unnecessarily, at wastewater treatment plants.

Inflow is when clear water enters the wastewater system through roof drains, sump pumps, or foundation drains that are illegally connected to sewer lines. Inflow is greatest during major storm events.

Infiltration is when groundwater seeps into cracked or broken wastewater pipes. Infiltration is a steady contributor to the problem, especially when the ground stays saturated due to steady rainfall. Infiltration quantities often exhibit seasonal variation in response to groundwater levels. Storm events can trigger a rise in groundwater levels and increase infiltration flows. The highest infiltration flows are observed following significant storm events or following prolonged periods of precipitation.

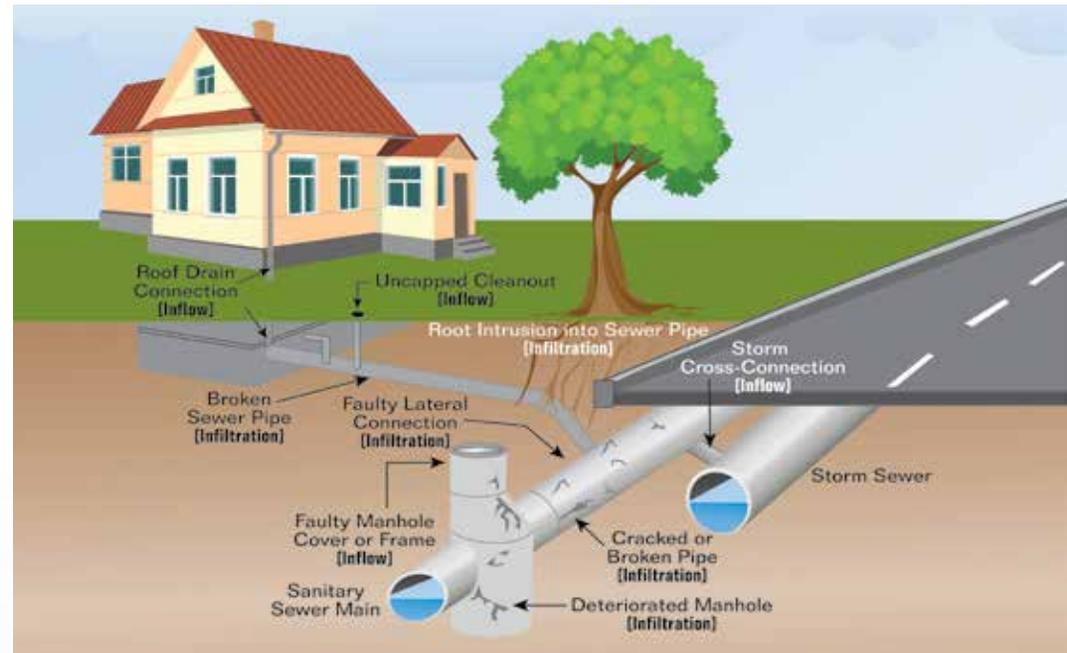
I/I can also be costly to communities. Once clear water gets mixed in with wastewater, it must be treated and that results in additional expenses that can increase rates for all users.

## Increased inflow during heavy rains can cause problems

Inflow is the biggest problem because during major rain events it quickly consumes pipe capacity needed for future growth. In more extreme rain events, inflow can cause sewage backups into homes and businesses. Inflow and infiltration reduce the ability of sanitary sewer systems and treatment facilities to transport and treat domestic and industrial wastewater. As a result, wastewater treatment processes can be disrupted and may allow poorly treated wastewater to be discharged to the environment.

## What can homeowners do about I/I?

- Familiarize yourself with your plumbing system. If you have roof drains that are piped underground, a sump pump that has no identifiable discharge point, or foundation drains that don't discharge to the road side curb, ditch or other low point on the lot, you may be contributing to the problem.
- Disconnect unlawful connections to the sewer system. Contact Water Resources to help you find reasonable alternatives.
- Locate clean-outs on your property and verify that they are intact. Broken or loose clean-out caps can contribute to inflow. Tighten or replace the cap. Contact a plumbing professional if needed.



- Do not open clean-out plugs to drain your yard, or pull manhole covers to drain flooded streets and intersections. Let these areas drain naturally. Contact Water Resources if you observe abnormal flooding.

## How does the City of Wilson minimize I/I?

A full time I/I Technician inspects the collection system daily for leaks and other problems. The city utilizes a closed circuit TV (CCTV) truck that uses a video camera and recording equipment to document leaky joints, breaks in pipes, etc. The city also has a crew that repairs manholes to eliminate leaks.

The City has an ongoing Capital Improvements Program (CIP) planned in 5 and 10-year segments to maintain, replace and expand segments of the wastewater collection system to meet increasing demands.

Collection System Maintenance and Projects completed:

- 58.5 miles of pipe cleaned (about 17% of the entire system)
- 75 manholes repaired
- 2,400 feet of pipe replaced
- 1,400 feet of pipe-bursting performed

## MISSION STATEMENT

“Protecting our Environment and Water Quality, through Teamwork and Excellent Service, now and for future generations.”

This report provides information concerning the City of Wilson's wastewater collection and treatment system performance for July 1, 2014 to June 30, 2015 as required in the North Carolina Clean Water Act of 1999 (House Bill 1160).

### HOMINY CREEK WATER RECLAMATION FACILITY (WRF)

The WRF is located in Wilson at 3100 Stantonsburg Road. It is a state-of-the-art regional treatment plant that processes wastewater for approximately 20,000 metered customers and a service population of approximately 50,000. The City of Wilson also treats wastewater from the Town of Black Creek, the Town of Lucama and the Town of Sims.



The term water reclamation defines the treatment or processing of wastewater to make it reusable with specific treatment reliability. Reclaimed water must also comply with very stringent water quality criteria. The term water reuse defines the use of treated wastewater for beneficial uses, such as agricultural irrigation and industrial cooling. The City of Wilson is committed to reusing reclaimed water in areas that drinking water is not needed such as irrigation water for Wedgewood Golf Course, Burt Gillette Athletic Complex and industrial process/cooling water. The reclaimed water system is part of the City's water conservation plan.

### NPDES PERMIT COMPLIANCE

The WRF was significantly impacted by the above normal rainfall experienced during winter and spring. Inflow/Infiltration caused by the extremely wet weather conditions contributed to four (4) permit limit violations (shown in red below). All other permit limits were in compliance.

### Table Definitions & Key

**PPM (Parts per Million)** - a unit of measurement. Parts per million compares to 1 minute in 2 years.

**BOD (Biochemical Oxygen Demand)** - a required test that determines the amount of oxygen required by microorganisms to consume pollutants. BOD is measured in PPM.

**TSS (Total Suspended Solids)** - a required test that measures the amount of suspended solids in a sample. TSS are measured in parts PPM.

**FC (Fecal Coliform)** - a required test used to determine the presence of disease causing organisms. FC are harmless but are used as indicators of other organisms (if FC are present others may be present). FC is measured as number of colonies per 100 milliliters of sample.

**MGD (Million Gallons per Day)** - a unit of measurement for flow volume.

### PLANT PERFORMANCE

Pollutant	Concentration
<b>Ammonia Nitrogen</b>	<b>PPM*</b>
Average	0.11
Permit Limit	1.0/3.0 (summer - monthly/weekly) 2.0/6.0 (winter - monthly/weekly)
<b>Biochemical Oxygen Demand</b>	<b>PPM</b>
Average	2.8
Permit Limit	5.0/7.5 (summer - monthly/weekly) 10.0/15.0 (winter - monthly/weekly)
<b>Violation - January 17, 2015</b>	<b>101 weekly</b>
<b>Violation - January 31, 2015</b>	<b>24.3 monthly</b>
<b>Total Phosphorus</b>	<b>PPM</b>
Average	0.166
Permit Limit	2.00 (quarterly)
<b>Total Suspended Solids</b>	<b>PPM</b>
Average	4.58
Permit Limit	30.0/45.0 (monthly/weekly)
<b>Violation - January 17, 2015</b>	<b>191 weekly</b>
<b>Violation - January 31, 2015</b>	<b>45.9 monthly</b>
<b>Total Nitrogen</b>	<b>Lbs/Yr</b>
Pounds Discharged	86,420
Permit Limit	157,886
<b>Fecal Coliform Colonies/100 milliliters (ml) of sample</b>	
Average	3
Permit Limit	200/400 (monthly/weekly)
<b>Chronic Toxicity</b>	
Test Performed Quarterly	Passed all
Permit Limit	Pass or Fail
<b>Flow</b>	<b>Million Gallons per Day (MGD)</b>
Average	9.86
Permit Limit	14.00 (monthly)

## SANITARY SEWER OVERFLOWS (SSOs)

Sanitary sewer overflows (SSOs) occur when untreated sewage is discharged into the environment prior to reaching sewer treatment facilities. These typically occur at manholes, pump stations or broken sewer pipes. Infiltration/inflow (I/I) is unwanted water that enters the sewer collection system through deteriorating older pipes, leaking manholes, illegal connections such as roof drains, etc. During heavy rains pipes can become overloaded from I/I and cause SSOs. Pipe stoppages caused by fats, oils and grease can also lead to SSOs. Replacing and rehabilitating these lines and manholes reduces I/I into the sanitary sewer system, thus protecting the public health, improving treatment plant efficiency and reducing system maintenance. Generators provide emergency back-up power for pump stations and help prevent SSOs.



During fiscal year 2014-2015, the City of Wilson experienced three (3) reportable SSOs. The WRF treated 3.6 billion gallons of wastewater during this period.

Customers who observe a SSO should report these as emergencies to the Water Resources Department between the hours of 8:30 am - 4:00 pm at 296-3403 or the afterhours emergency line at 399-2444.

### January 12, 2015

700 Vance St. E at Vick St.

Total: 537 gallons

Cause - I/I during heavy rains

### January 12, 2015

1300 block of Canal Drive at Kincaid Ave.

Total: 500 gallons

Cause - I/I during heavy rains

### January 12, 2015

Intersection of Grove St. and Turner Ave.

Total: 975 gallons

Cause - I/I during heavy rains

Cientes que observen el desbordamiento de alcantarillas sanitarias deben reportar éstos como emergencias al el Departamento de Recursos Hídricos telefono 296-3403 entre las horas de 7:30 am a 4:00 pm o el 399-2444 después de horas laborables.

## HOW DOES YOUR PUBLICLY OWNED TREATMENT SYSTEM WORK?

The treatment system uses the same physical, chemical and biological processes used by nature to clean water. Everything we know about water, chemistry, bacteria, hygiene and engineering has gone into this system we use to purify our wastewater. The City maintains about 350 miles of sanitary sewers lines (piping system that collects and transports the wastewater) and 20 pumping stations that help carry wastewater from homes, schools, commercial buildings and industrial sources to the treatment plant.

Once at the WRF the treatment process begins. The treatment plant is designed to treat 14 MGD. The plant currently averages treating 9.9 MGD. The following describes the treatment process:

### Physical Methods - Primary Treatment

- Bar Screens - catch and remove large material (wood, rocks, etc) as they flow past.
- Grit Chamber - removes heavy particles that settle rapidly like gravel, sand, seeds and coffee grounds. As the water enters the chamber, gravity causes the grit to settle to the bottom.
- Sedimentation (settling) Tanks - as water flows into the tanks, heavy organic particles settle to the bottom and are withdrawn and pumped to the solids handling facilities for additional treatment. Floatable material is skimmed off and pumped to the solids handling facilities.

Primary treatment removes approximately 45% of the pollution.

### Biological Methods - Secondary Treatment

- Activated Sludge - wastewater is mixed with millions of microorganisms. During constant aeration (mixing air containing oxygen into the wastewater) the microorganisms (bacteria) absorb oxygen and feed on the pollutants.

- Final Settling Tanks - solids made up of microorganisms from the activated sludge process settle to the bottom. Some of the microorganisms are sent back to the activated sludge process to continue eating pollutants and some are removed and sent to the solids handling facilities for disposal.

Secondary treatment removes approximately 95% of the pollution; HOWEVER, in order for the WRF to comply with permit limits, additional treatment is needed.

### Physical/Chemical/Biological Methods - Advanced Treatment

- Nutrient Removal - nutrients (phosphorous and nitrogen) can cause an over abundance of algae growth in waterways. As the algae dies, bacteria feed on the decaying matter using up oxygen needed by fish and other aquatic life. This depletion of oxygen can lead to fish kills. Phosphorous and nitrogen are removed biologically and chemically at the treatment plant.
- Filtration - removes those particles that primary and secondary treatment could not remove. The wastewater passes through sand filters that remove remaining particles. Filtration removes 99.9% of the pollution.
- Disinfection - the final stage of treatment uses sodium hypochlorite (liquid bleach containing chlorine) to disinfect the water. Disinfection kills off any disease-causing organisms that may remain after passing through the other treatment steps. Chlorine can cause problems in rivers and streams so we remove the chlorine before discharging the treated water to Contentnea Creek.

### Returning the Water to Nature or Reusing the Water

Most of this clean water - now called effluent - is discharged into Contentnea Creek but some of the effluent is sent to the City's reclaimed water system (beneficial reuse) to be used for irrigation or industrial process water and cooling water.

### What's Left Behind

Now, what about the material that has been removed from the water? These solids are called residuals: heavy matter that must be treated in order to safely return to the environment.

The following steps are used to further treat the residuals:

- Enclosed heated tanks called digesters use microorganisms to turn the residuals into inert (inactive), harmless organic matter.
- Belt filter presses are used to remove water from the residuals to reduce the volume that must be disposed of.
- Land application (beneficial reuse) of treated residuals. The treated residuals (organic material) are used by area farmers as a fertilizer and soil amendment.

### Biogas

A by-product of the digestion process described above is the production of methane gas (biogas). The WRF uses part of the biogas produced as fuel to heat the digesters, thus significantly reducing the amount of time required to digest the solids. The excess is burned off by a waste gas burner. The City has future plans to install a system that will utilize the excess biogas to generate energy that can be used to operate other equipment or used for green energy credits.



Wedgewood Reuse Tank

## DISPOSABLE DOES NOT MEAN FLUSHABLE

Flushing paper towels and other garbage down the toilet wastes water and can create sewer backups and SSOs. The related costs associated with these SSOs can be passed on to ratepayers. Even if the label reads "flushable", you are still safer and more environmentally correct to place the item in a trashcan.

The following is a partial list of items that **should not** be flushed:

- ✗ Baby wipes, diapers
- ✗ Cigarette butts
- ✗ Rags and towels
- ✗ Cotton swabs, medicated wipes (all brands)
- ✗ Syringes
- ✗ Candy and other food wrappers
- ✗ Clothing labels
- ✗ Cleaning sponges
- ✗ Toys
- ✗ Plastic items
- ✗ Aquarium gravel or kitty litter
- ✗ Rubber items such as latex gloves
- ✗ Sanitary napkins
- ✗ Hair
- ✗ Underwear
- ✗ Disposable toilet brushes
- ✗ Tissues (nose tissues, all brands)



## FOR MORE WATER QUALITY INFORMATION

City of Wilson - Water Reclamation Facility  
(252) 399-2492 www.wilsonnc.org

N.C. Environmental Education  
www.eenorthcarolina.org

Lower Neuse Basis Association  
http://www.lnba.net

NCDENR (919) 733-2321 www.ncdenr.gov

Water's Worth It www.waters-worth-it.org

River Guardian Foundation, Inc.  
www.riverguardfdn.org

Neuse Riverkeeper Foundation  
www.neuseriver.org

## WHAT THE CUSTOMER CAN DO TO HELP

In order to help the City of Wilson continue a high standard of water quality and protection of the environment please follow these simple steps:

**DO NOT** pour grease, fats and oils from cooking down the drain - instead, collect the grease in a container and dispose of it in the garbage.

**DO NOT** use the toilet as a wastebasket - instead, place a wastebasket in each bathroom for the disposal of solid waste, disposable diapers, condoms, and personal hygiene products that DO NOT belong in the sewer system.

**DO NOT** use the sink to dispose of food scraps - instead, place food scraps in the garbage for disposal with solid wastes, or better yet, start a compost pile.