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WASTEWATER case study

JACKSONVILLE, NC

Cleaning up the New River – This City Sets the Example Hoping Others Will Follow

The land treatment spray fields use over 18,000 Senninger sprinklers at a spacing of 60 feet x 80 feet to cultivate pine trees and create an environment for wildlife.

Project:
Land Application Treatment

Engineer:
Malcolm Pirnie, Inc.
Charlotte, NC

Product:
- Senninger 4023-1-3/4" EFF F-luent-Master™ Impact Sprinkler
- Senninger Medium Flow Pressure-Master® Regulator

Installation Date:
1998

The city of Jacksonville, in Onslow County North Carolina, has grown tremendously in the past several years. About ten years ago they were faced with a critical situation regarding the expansion of their existing wastewater facility. Up until that time, they had been discharging an approved level of effluent into the New River. But the city recognized the need to do something to change their impact on the environment. The result is their new $45 million land treatment facility.

The overall project design was handled by Malcolm Pirnie, Inc. of Charlotte, North Carolina. They in turn employed the services of Earth Systems Associations Ltd. of Athens, Georgia. Nutter and Associates designed the land application portion of the system.

The soil absorbs nutrients like phosphorus and nitrogen from the irrigated effluent water thus promoting growth of trees and natural area vegetation.

All wastewater generated in the city is collected at one central location, the main pump station on Highway 17, and pumped eight miles to the land treatment site.

System Design

The treatment system is designed to treat six million gallons per day *(MGD)* of wastewater with expansion potential to nine MGD providing for additional capacity needed to support the growth of the city. All wastewater generated in the city is collected at one central location, the main pump station on Highway 17, and pumped eight miles to the land treatment site. The new facility is already having a positive impact on the environment by:

- Disposing of wastewater in an environmentally safe manner
- Eliminating the discharge of up to 5.2 MGD of treated wastewater into the New River
- Providing a 6,300-acre site which after construction will provide an environment where wildlife can flourish, 1/3 of which is dedicated to spray irrigation fields where pine trees are cultivated.

(left) Screening and grit removal are just the first of four steps in the treatment process.

(left) Floating aerators in each treatment pond assist in the biological treatment of the wastewater.

(below) The pumps presently handle approximately 6 million gallons a day with the expansion potential of up to 9 million gallons a day.

Treatment at the site can be broken down into four steps: Screening and grit removal; Biological treatment ponds and storage; Disinfection; and Spray irrigation of treated wastewater in forested areas.

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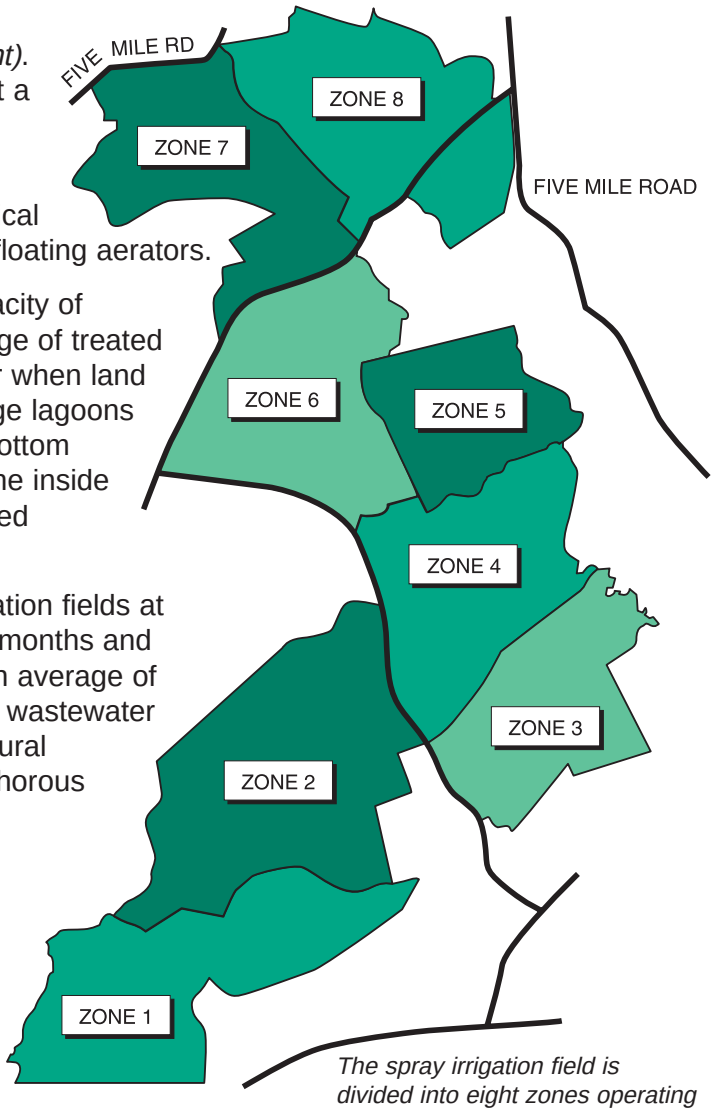
The spray irrigation field is divided into eight zones, each is irrigated one day per week *(diagram on right)*. The spray fields use over 18,000 Senninger units at a spacing of 60 feet x 80 feet.

The treatment ponds cover ten acres and have a capacity of 40 million gallons. Each provides biological treatment of the wastewater with the assistance of floating aerators.

The storage ponds cover 90 acres and have a capacity of 340 million gallons when filled. These provide storage of treated wastewater during the periods of inclement weather when land application of wastewater is not feasible. The storage lagoons are built to the highest standards. This includes a bottom clay liner and a high-density polyethylene liner on the inside berm walls. All of this is designed to retain the treated wastewater and protect groundwater.

The treated wastewater is applied in the spray irrigation fields at the rate of 1.4 inches per week during the summer months and 0.7 inches per week during the winter months, or an average of four to six MGD. The final purification of the treated wastewater is provided by the filtration of the soil, trees and natural vegetation. Nutrients from the water such as phosphorous and nitrogen are exactly what is needed to support rapid tree growth.

The specially designed 4023 F-luent-Master™ single nozzle sprinkler is ideal for the disposal of effluent by land treatment methods in accordance with EPA guidelines. It is suitable for use on solid set systems, or with minor modifications, on center pivots or other mechanical-move systems.



The spray irrigation field is divided into eight zones operating even-numbered zones first followed by odd-numbered zones

The sprinkler assembly includes a Medium Flow Pressure-Master Regulator® *(Model PMR-50-EFF)* with a preset pressure of 50 psi to maintain a consistent base pressure on all units. Each regulator is water-tested to ensure precise operation within 6% (plus or minus) variance of design pressure at a given flow rate. No adjustments are needed. Precision parts and close tolerances help provide consistent, reliable with very low hysteresis and little inherent friction loss.

Features of the Senninger 4023 F-luent-Master™:

- Flow range: 4 - 14 gpm
- Sprinkler base pressure: 25 - 70 psi
- 23º angle of trajectory
- High-impact engineering-grade thermoplastic construction provides excellent corrosion resistance
- Sprinkler cap is lavender for to correspond to industry standards denoting non-potable water
- Splasharm spring and bearing enclosed for protection against contamination
- Springs and fulcrum pin are top quality stainless steel – absolutely no brass components
- The nozzle / barrel cylinder combination minimizes obstruction from water-borne materials
- Two-year warranty on materials, workmanship and performance

The sprinkler is a Senninger 4023 single nozzle F-luent-Master™, specially designed for effluent solutions. The assembly also includes a Senninger Medium Flow Pressure-Master Regulator® with a preset operating pressure of 50 psi.

Summary

This land application treatment facility is notable for several reasons. The size of the project is quite large, one of the largest solid set land treatment applications in the United States. More importantly, through careful planning and analysis the City of Jacksonville has succeeded in eliminating their environmental impact on the New River. In turn, the re-directed wastewater has created a new system that uses natural means to filter water.

Investment.....$ 50 million	Completion Date .....Dec. 31, 1997
Site Acreage .....6,200 acres	Site Perimeter .....39 miles
Perimeter on St. Roads .....28 miles	On-Site Sewer Pipe .....250 miles
Sprinklers 18,000	Treatment Time .....6-7 days
Storage Lagoon Capacity..340 million gal	Average Lagoon Depth.....11.5 ft.
Aerated Lagoon Capacity....40 million gal	

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